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electronics

business edition

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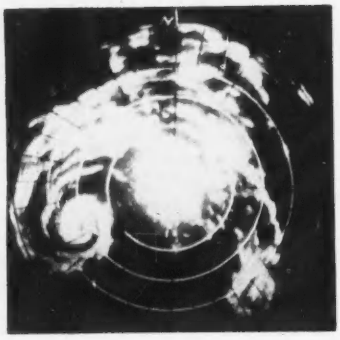

Electronics Probes Weather

Bureau to spend $2 million p18

Test Equipment Sales Increase

Special Market Report p24A

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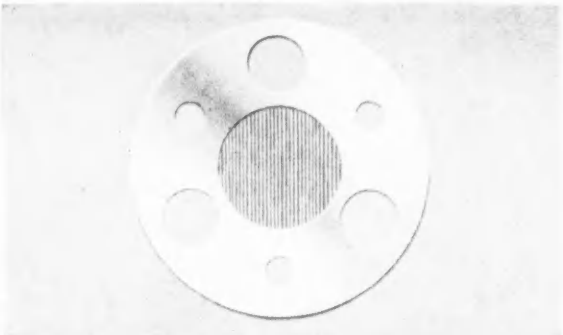
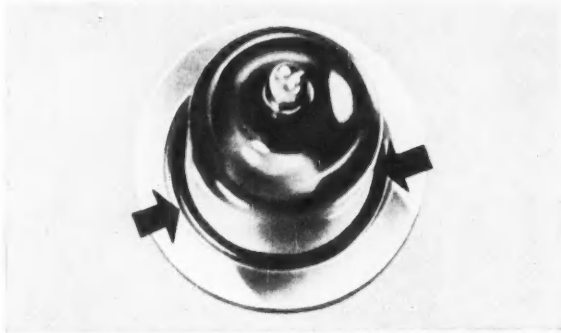
Sylvania Planar-Triode Rocket® Tubes



Stretched-grid construction—assures low-noise, uniform, efficient operation. Unique parallel wire construction is characteristic of Sylvania planar triodes and a principal factor in their stable performance.



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—for maximum efficiency in UHF and microwave frequencies

For communications, radar, and any equipment operating in the range between UHF and microwave frequencies Sylvania offers a line of planar triodes for efficient CW and pulse operation.

All Sylvania planar triodes feature the stretched, parallel-wire grid and disc seal—developments typical of Sylvania's leadership in these highly specialized tubes. Both single- and double-ended types are offered.

Concentric design lends itself to a variety of simplified cavity designs. Mounted in cavities, planar tubes deliver stable output over a broad tunable frequency band.

Sylvania planar triodes include single-ended and double-ended types designed for both cw and pulse operation.

TYPE	DESCRIPTION
2C36	pulse-modulated oscillator for concentric-line cavity operation. Maximum operating frequency—5000 mc.
6503	CW oscillator for frequencies up to 3300 mc—Ruggedized anode design for shock and vibration.
2C37	CW oscillator to 3300 mc, amplifier and frequency multiplier.
6481	general-purpose medium mu triode—CW oscillator at frequencies up to 3300 mc.
5768	high mu double-ended type designed for grounded grid CW amplifier. Used with tuned or untuned input—tuned coaxial line output.
6BA4	double-ended UHF amplifier, suitable for TV UHF frequencies.
5765	CW oscillator with internal feedback. Broad frequency range up to 2900 mc.
5764	pulse-modulated oscillator at frequencies up to 3300 mc.

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-hp- signal generators outsell other signal sources by approximately 2:1. Engineers report the reasons are simpler operation, versatility, trouble-free performance, and exceptional value.

Instrument	Frequency Range	Characteristics	Price
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-hp- 608D	10 to 420 MC	Output 0.1 μv to 0.5 v into 50 ohm load. CW, pulse or AM mod. Direct calibration and crystal calibrator check	1,050.00
-hp- 612A	450 to 1,230 MC	Output 0.1 μv to 0.5 v into 50 ohm load. Pulse, CW or amplitude modulation to 5 MC Direct calibration.	1,200.00
-hp- 614A	800 to 2,100 MC	Output 0.1 μv to 0.223 v into 50 ohm load. Pulse, CW or FM modulation. Direct calibration.	1,950.00
-hp- 616A	1,800 to 4,000 MC	Output 0.1 μv to 0.223 v into 50 ohm load. Pulse, CW or FM modulation. Direct calibration.	1,950.00
-hp- 618B	3,800 to 7,600 MC	Output 0.1 μv to 0.223 v into 50 ohm load. Pulse, CW, FM or square wave modulation. Direct calibration.	2,250.00
-hp- 620A	7,000 to 11,000 MC	Output 0.1 μv to 0.223 v into 50 ohm load. Pulse, CW, FM or square wave modulation. Direct calibration.	2,250.00
-hp- 623B	5,925 to 6,575 MC; 6,575 to 7,175 MC; 7,175 to 7,725 MC	Output 70 μv to 0.223 v into 50 ohm load. FM or square wave modulation. Separate power meter and wave meter section.	1,900.00
-hp- 624C	8,500 to 10,000 MC	Output 3.0 μv to 0.223 v into 50 ohm load. Pulse, FM or square wave modulation. Separate power meter and wave meter section.	2,265.00
-hp- 626A	10,000 to 15,500 MC	Output 1 $\mu\mu$watt to 10 mw. Internal or external pulse, FM, or square wave modulation. Direct calibration.	3,250.00
-hp- 628A	15,000 to 21,000 MC	Output 1 $\mu\mu$watt to 10 mw. Internal or external pulse, FM, or square wave modulation. Direct calibration.	3,000.00

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- **$2 billion raised by NYSE firms**
- **Sperry Rand gets $53 million**
- **IBM offering $200 million**

Firms in our industry in search of additional capital are looking more to their own shareholders.

They offer shareholders rights to purchase new stock at a discount. Many issue rights to purchase one new share for each ten or five shares held. Discounts to shareholders commonly range from 3 to 17 percent.

With price of new stock issue set below market price, shareholders can sell their rights or maintain equity interest by exercising them.

More than $2 billion was raised through stock-rights offerings in the past two years by NYSE listed firms. In 1956, through rights offerings, 41 companies sold $1.1 billion of additional common stock. The year before, 46 companies similarly raised close to $1.0 billion.

Sperry Rand which used rights to raise $53 million in 1956 was one of the leading industrial users of this stock selling method.

North American Aviation followed Sperry closely with $44 million of new capital obtained through rights. Another NYSE firm with electronics interests that used rights in 1956 was Royal McBee. It raised nearly $5 million.

Market observers expect rights to be a popular money-raising method in 1957. A growing number of companies currently prefer issuing common stock to borrowing. Rights ease job of selling common stock.

IBM is making one of the biggest rights offerings in 1957 this month. It is offering stockholders rights to purchase $200 million of new common stock. It will be first time in over 30 years for IBM to sell new common stock.

SHARES and PRICES

Servomechanism manufacturers are in an enviable market position.

Mounting industrial automation trend should sharply increase servomechanism demand. Servo control is an integral part of many industrial automation systems.

Professional investors regard automation systems as one of the most attractive growth areas of the industry. Proportion of workers to nonworkers in the population is rapidly declining because of low birth rates in the thirties. In addition, wage rates continue to mount while work week shortens.

However, bulk of current demand comes from big $3 billion dollar military market. Servomechanisms are used with fire control, missile guidance and aircraft navigation systems. They are well entrenched in this market and basic demand should continue strong.

Nevertheless, military business has disadvantages. Extensive use of servomechanisms in advanced military equipment means business often comes from small-profit research and development contracts. However, experience gained may pay off in industrial business.

Typical Servomechanism Manufacturers	Recent Price	1956 Dividends	Yield Percent	Earned per Share 1956	Earned per Share 1955	Traded	1957 Price Range
Belock Instrument	10½	stock	...	0.58 (year)[4]	0.89	ASE	9¾–13⅜
Bendix Aviation	61¼	2.40[2]	3.9	5.04 (year)[4]	5.66	NYSE	57½–62⅜
Consolidated Electrodynamics	39	0.50	1.3	0.60 (6 mo)	0.85	ASE	31¼–40
Dynamics Corp. of America	6¼	0.40	6.4	0.28 (6 mo)[5, 6]	0.61	ASE	5¾–7⅛
Emerson Electric	29	1.40[3]	[4]	3.47 (year)[5]	2.33	NYSE	29–32⅞
Huyck (F. C.)	36[1]	1.40	3.9	3.85 (year)	3.80	OTC	...
Minneapolis-Honeywell	86¾	1.75	2.0	3.40 (year)	2.98	NYSE	73½–87
Norden-Ketay	10	...	...	d-0.39 (year)	d-0.18	ASE	7⅞–10⅜
General Precision Equipment	37⅜	2.40	6.3	1.63 (year)	2.05	NYSE	36½–43⅞
Servo Corp. of America	5⅞	0.20	3.4	0.21 (6 mo)	0.55	ASE	4⅜–5⅞
Servomechanisms	10⅜	0.40	3.9	0.81 (year)	0.58	ASE	9½–11
Standard Coil Products	8¼	...	...	d-1.27 (year)	d-0.22	NYSE	6½–9⅜

[1] bid [2] plus stock [3] annual dividend rate [4] stock split in '56 [5] fiscal year [6] earnings estimated

For Sales: Merge

INCREASING NUMBERS of electronics mergers influenced by marketing are appearing. A common pattern is for one of the two companies to take over the major share of the marketing load. Often this is done by establishing a jointly owned corporation.

A recent example is Gulton Speidel. It was formed by Gulton Industries, Metuchen, N. J. and the Industrial division of Speidel, Providence, N. J. to market a line of mass produced precision instruments that will be manufactured by the two companies.

Existing Gulton marketing organization of field salesmen, engineers and reps will form the backbone of the marketing organization. Gulton has experience in selling instruments. The Speidel sales organization has experience in selling components.

Marketing objectives figure in the merger of Production Instruments, Chicago, and General Controls, Glendale, Calif. This merger did not result in a new marketing corporation. But Production Controls, which will operate as a division, will receive a marketing assist from the 42 branch offices of General Controls in the U. S. and Canada.

There is a point-of-sale recorder marketing marriage between Telecomputing and Remington Rand. Telecomputing manufactures the recorders and Remington Rand does the marketing. This case entailed neither merger nor a new corporation.

Another venture engendered by marketing considerations is Royal Precision, formed by Royal McBee and General Precision.

Announces Diffused Silicon Transistor

COMMERCIAL availability of a gaseous diffused-junction silicon transistor has just been announced by Texas Instruments.

The unit, type 2N389, has a rated power dissipation of 37.5 w at 25 C and 15 w at 100 C, makes possible high-power transistor circuitry for guided-missile and geophysical equipment operating in the temperature range—65 to 150 C.

The 2N389 has a 60-v collector-to-emitter rating, can be powered directly from 28-v aircraft power supplies. It has a maximum saturation resistance of 6 ohms. Operating frequency varies with power loading. It will operate as a power amplifier at 5 mc. At 1 mc and 9 w dissipation, the unit has a beta of 10, measured at 0.3 ampere collector current, grounded emitter.

MERGERS, ACQUISITIONS and FINANCE

• **General Instrument** gets control of **Radio Receptor** of Brooklyn, N. Y., by purchasing 80-percent stock interest. This is third acquisition in 12 months for General Instrument and is part of program of diversifying in industrial and military fields. It combines G.I.'s silicon rectifier mass-production facilities with selenium facilities of Radio Receptor. It also expands G.I.'s semiconductor business to both germanium and silicon types.

• **Atlantic Research**, Alexandria, Va., acquires **U. S. Flare** of Pacoima and Saugus, Calif. Acquisition will support Atlantic Research's expanding rocket and missile development work. U. S. Flare produces rocket ignition and missile-tracking systems, as well as pyrotechnic and high-explosive ordnance items. It will continue to operate under U. S. Flare name as an Atlantic affiliate.

• **Beckman Instruments** and **Statham Laboratories**, Los Angeles, Calif., stop merger talk. Original plans called for Statham stock to be exchanged for up to 400,000 shares of Beckman. "Certain problems have developed which make it advisable to discontinue active negotiations," comments Arnold O. Beckman. "It is not possible now to state when or whether negotiations will be resumed."

• **American Broadcasting-Paramount Theaters** arranges for $65 million of financing from Metropolitan Life Insurance and five banks. New money is being used to repay existing debt of $37.2 million and to provide $27.8 million of additional funds. Banks are providing $12.5 million and Metropolitan is supplying remaining $52.5 million.

• **Thompson Products** registers 125,000 shares of $5 par common stock with SEC. Stock is to be offered to officers and key employees under stock-option plans.

• **Vitro Corp. of America** issues common stockholders rights to subscribe to 178,646 shares of additional 50-cent par common stock at $16 a share. Shareholders have right to purchase one new share for each five held. Blyth & Co. heads underwriters.

• **AMP** directors express intention to declare a 4-percent common stock dividend during 1957.

• **Ampex Corp.**, Redwood City, Calif., is discussing alliance plans with **Orradio Industries** of Opelika, Ala., manufacturer of magnetic recording tape. Ampex proposes to buy an undisclosed but substantial interest in Orradio stock. However, two firms would continue as separate entities. They plan to work together to develop high quality tape for instrumentation, video and computer applications. Ampex is manufacturer of Videotape Recorder for television broadcasting and ther operations.

Henry Rosenfeld, President of Henry Rosenfeld, Inc., asks:

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"One of these models has kept only one date – the other, over 50,000!

"On the left is the one-date model – the original, hand-made, custom-designed 'Henry Rosenfeld dress #5026.' Its only date was our Spring showing.

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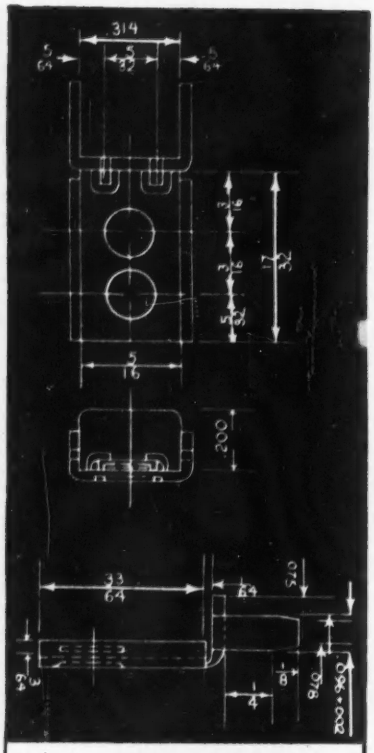

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WASHINGTON report

GOVERNMENT is moving ahead with ambitious plans to bring its air traffic control system up to jet-age standards through development and use of electronic tools.

Edward Peck Curtis, aviation advisor to President Eisenhower, has drafted a program to make a ten-fold reduction in the air collision hazard by 1975, while handling ten times as much traffic.

The Eisenhower administration, already worried by the growing collision hazard inherent in the increasing speed, density and complexity of aircraft movements, gave special priority to developing improved air traffic control following the traffic crash of two airliners over the Grand Canyon last June.

The Curtis report, presented to the President the week of May 6, calls for strict traffic control of all aircraft movements—whether civil or military—above 18,000 feet, and of all other flying on congested routes at lower altitudes. This kind of positive control—in which the pilot must guide his plane along routes and altitudes assigned by ground controllers—is now mandatory only when bad weather prevails.

The administration hopes to begin switching to the new system by 1960, and to have it in full operation by 1975.

The proposed system, which cannot be implemented until and unless Congress votes the money, will be expensive. It involves stepped-up development and use of automation devices for calculating arrival times, displaying traffic movements and for communications.

No price tag has been put on the proposal as a whole. However, $35-40 million annually would be required for development work alone. The cost of buying and installing operational equipment is unknown, but is bound to be vastly greater than the $810 million the government planned to spend anyway for improvements during the next six years, based on existing equipment.

Hold-down on overtime pay for employees of defense suppliers is something that electronics contractors are going to have to live with for some time. Producers of aircraft and components will be hit hardest; those making items for ballistic missiles will be exempted if overtime contributes directly toward more rapid solution of problems that now hold back the missile field.

The real bite of the order is this: plant representatives of the military can authorize overtime but only up to 2 percent of the man-hours of a project; if overtime would run higher than this to meet a production schedule, they must get prior approval of higher-ups.

One estimate has it that some 4 percent of total payments for aircraft procurement is for overtime pay. Officials say overall electronics expenditures are running pretty close to what is expected.

Electronics firms aren't likely to be hit by the new drive against fast tax write-offs, whether they are in manufacturing or research and development. Senator Byrd (D., Va.) is pushing a bill to restrict rapid five-year writeoffs to companies who have a defense contract in hand—a bit of legislation which new mobilization chief Gordon Gray doesn't think is necessary. His point: only companies with defense contracts now get amortization certificates, as a result of ODM rulings.

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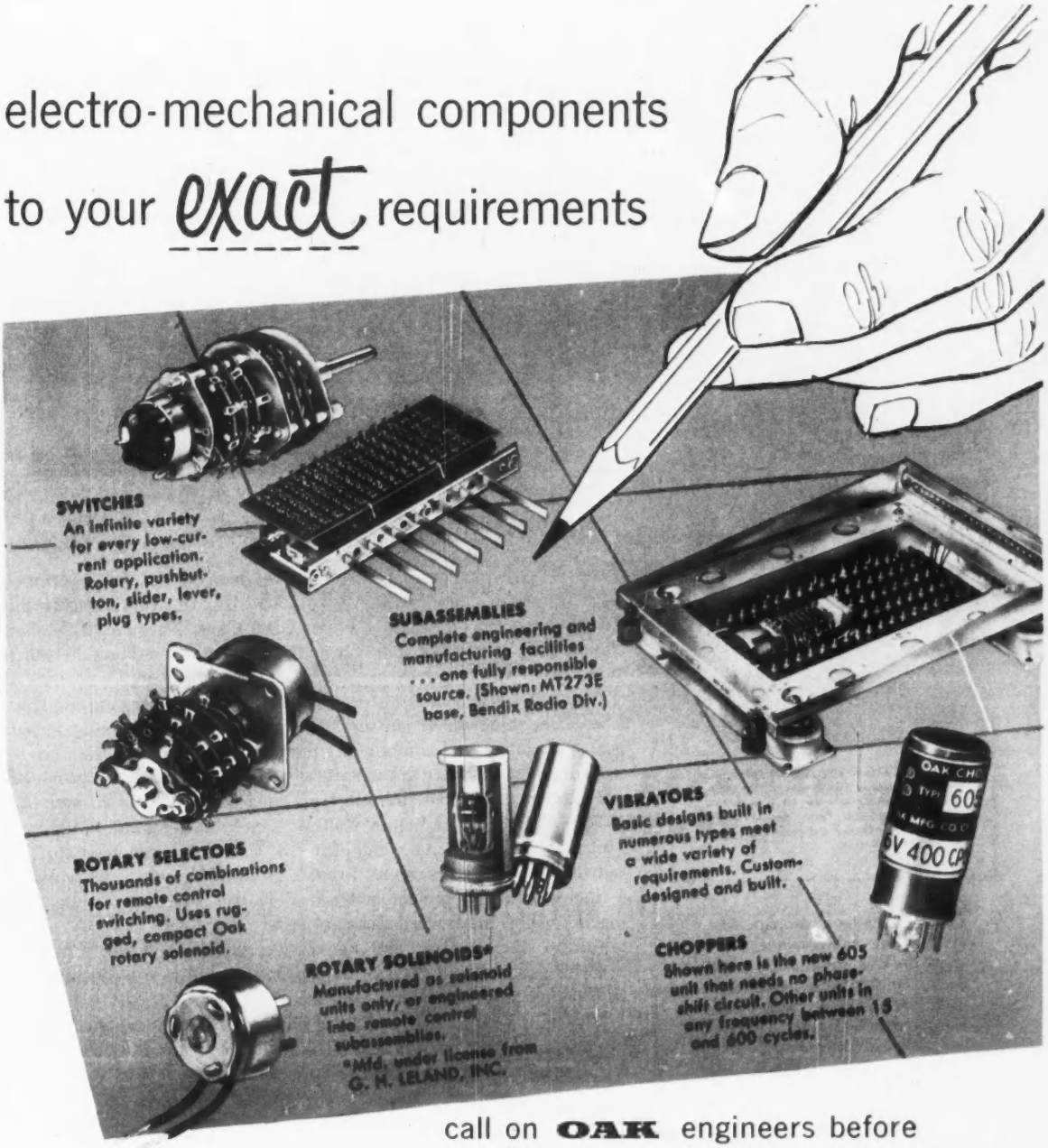
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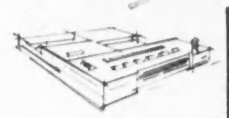

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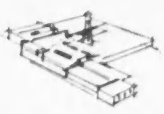

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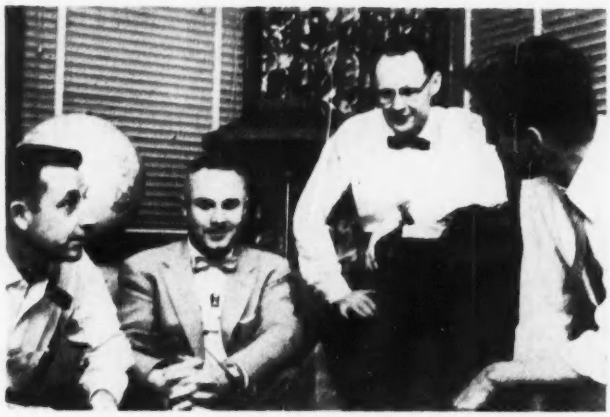


McLean*: no time to read

WINNER of biggest prize—$25,000—ever handed out by government's incentive awards program is William B. McLean, technical director of Naval Ordnance Test Center, China Lake, Calif. Navy credits McLean's design standards with saving the government $46 million in the first year of Sidewinder guided missile production alone.

McLean conceived air-to-air Sidewinder while working on Navy's Bat. The Sidewinder missile has infrared detection and computing gear built into fewer components than a table radio.

Economies in design come naturally to 42-year-old gadgeteer McLean, who has been a do-it-yourself type since schooldays. It was photo-enlargers and canoes before Caltech; since his doctorate (1939), the gadgets are slightly more complex. A Van de Graaff generator came out of one research project. Friends at Iowa U., where he worked on a nuclear research project between 1939 and 1941, say he was in the machine shop more often than not.

Bureau of Standards had his services all through the war. Since 1945 his gadgeteering energies have been directed to fire-control systems for missiles and rockets at China Lake.

Vivacious wife LaVie, a physical education instructor, encourages his interest in sports (favorite: skindiving), shares his enthusiasm for dancing (Latin rhythms preferred), goes with him to the local concert series. Common interests also include three sons, 6, 12 and 14. It's no wonder he says "I don't have time to read as much as I'd like to."

* Third from left, with associates Ward, Wilcox and LaBerge

Strictly PERSONAL

Security for the Insecure

This whole mess surrounding Col. John Nickerson (Apr. 20, p 8) is an illuminating reflection of military security. A good man like Nickerson can be crucified because he "leaked secret details about IRBM." (Isn't he really being court-martialed because he criticized Secretary Wilson and the Air Force, neither of whom can do wrong?) A thousand incompetencies, stupidities, mistakes and outright frauds can be hidden under security wraps, with the need-

to-know clause hiding negligence, malfeasance and misfeasance.

It takes only a commission in the services to classify a piece of information as confidential. How many thousands of inequities go unheeded each year because some yut figures no one really needs to know? Contrariwise, how many research dollars are wasted each year because the services mask the left hand from the right (which really needs to know what the left's doing) with security? Like the $175 million so far down the drain on Jupiter.

It's a form of paranoia: people invoke security because they feel insecure. And the services must be fantastically insecure to be hiding so much of what they do—important or trivial, common knowledge or frontier breaking stuff—under security classification.

GENE G. MACAULAY
PHILADELPHIA, PA.

Air Facilities

After all the fuss, Edward Curtis' long-range plan for the nation's air facilities doesn't seem to say much. What on earth have he and his dozen systems men been doing for a year—besides writing speeches?

E. R. CARROLL
CHATHAM, MASS.

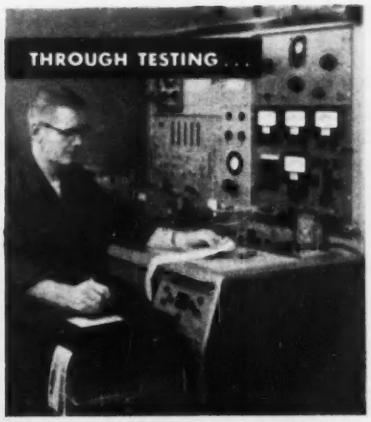
For a hint, see p 6.

Simplicity for Autocybernation

"Creating confusion," says Robert Verkeller (Apr. 20, p 11), speaking of coming new words, and he's quite right. The only agreement anyone's reached so far about even the word *automation* is that it means making things more automatic. (Than what?)

Simple English words can do the trick neatly. Consider the technology of automatic controls. It doesn't help a bit to describe this as *electronation* if to every second hearer we must explain the word to mean *the technology of automatic controls in which electronics does the work*. How much simpler to say what we mean in the first place.

R. SCHIRMER COLVIN
EMERY UNIVERSITY
GEORGIA



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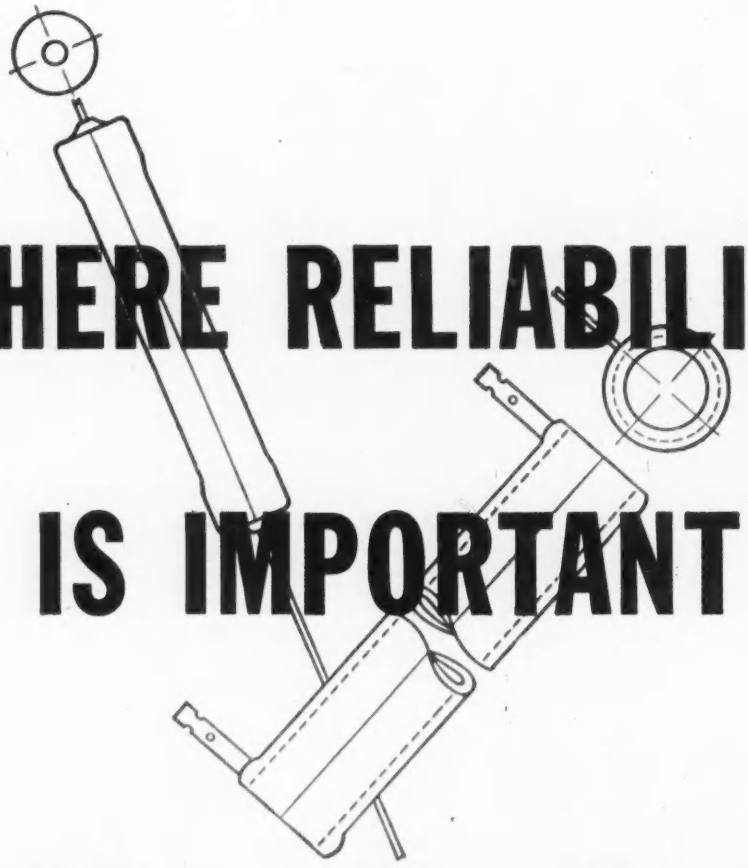

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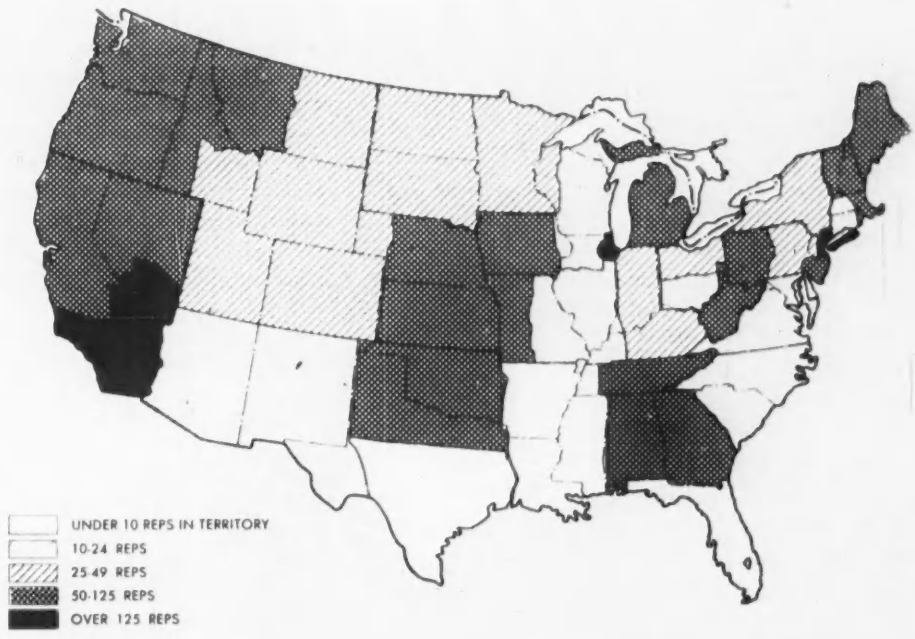
MAY 20, 1957



RETMA jobber plan may make better use of industry's 1,500 reps

UTP: Guide for Parts Trade

- **RETMA proposal splits $620-million parts distribution pie**
- **Thirty trading areas would cover United States**
- **Parts producers urged to use UTP in setting up channels**

THIS WEEK sees manufacturers, representatives and jobbers getting together in Chicago for the Electronic Parts Distributors Show. Radio-Electronics-Television Manufacturers Association will seize the opportunity of having them in one place to beat the drums for UTP.

UTP—Unit Territory Plan—was devised by RETMA's Jobber Relations committee. It's designed as a guide to manufacturers and their reps interested in selling electronic parts through independent parts jobbers. Plan has already been adopted by many manufacturers.

Jobber sales account for perhaps a third of electronics parts volume. The rest goes straight from factory to end-equipment producers or government through reps and factory salesmen. RETMA would like to bring more order into distribution business generally, figures on starting with fairly well-defined area of parts distribution.

UTP divides the country into 30 territories. Divi-

sions (map) are based on several rules of thumb, with a couple of hangnail exceptions:

- Each area is supposed to account for at least 2 percent of total parts business. (Actually, two areas can not yet produce 2 percent between them, another accounts for only 1.73 percent.)
- Each area has about 40 parts jobbers (or wholesale distributors; RETMA uses the terms interchangeably).
- Most areas can be served on a monthly cycle by a single rep organization. (All three areas making up the metropolitan New York region could easily be served by one rep, as could the two-area state of Ohio.)

This year's $945-million parts business will ring up a whopping $620 million or more in the tills of distributors and reps.

Dollar worth of wholesale parts business has quadrupled since the war, may triple again by 1960. Growth has not been painless.

- Increased number of distributors reduces time a rep can spend on any one line with each distributor.
- Still growing territorial organizations hamper reps, delay complete service.
- New manufacturers and reps, with no guide to follow, sometimes set up patchwork systems with gaps and overlaps.

Jobbers have not had an easy time of it despite growth patterns in electronics. Competition is fierce among the industry's RETMA-estimated 1,200 distributors.

Many jobbers pack upwards of $250,000 worth of goods on their shelves, sometimes shipped to them on consignment.

Common bane of tight money adds headaches, has stemmed the tide of new ventures. One estimate has it that 30 distributors entered the field last year. Key to successful jobber enterprises today, says one big Midwest distributor, is the ability to "purchase equipment in quantity and pay for it in cash."

Industry growth depends in large measure on strength of independent wholesalers. UTP is a step intended to increase this strength, may clear up some of the fog in channels of distribution.

RETMA feels the plan will benefit everybody:

- Manufacturer can franchise one rep per area to handle his jobber line, with no state-line vs. trading-area quarrels.
- Reps serving jobbers will be able to cut travel, staff, office expenses, concentrate on hard selling.
- Distributors will get more frequent rep calls, cut inventories, keep up with new products.

Builders Show Puts Electronics in Home

HOMEMAKERS wandering through New York's Coliseum last week saw previews of tomorrow's home, lushly displayed and decorated by nation's finest talent. International Home Builders Exposition also gave viewers a chance to see some of the ways our industry contributes to ease of living.

Besides ion-chamber air cleaners, electroluminescent lighting, two-way communications, electronic organs and pianos already infiltrating the home, these developments hit home to homemakers:

- Ultrasonic garage-door opener with transmitter in the car and receiver in the garage. Included as part of Overhead Door Corp.'s product.
- Capacitance switches for central master control of all lights in a house, or to reduce fumbling in dark places.
- Sound-husher to cut volume on the family hi-fi when somebody's on the phone, made by Carloma Corp., St. Louis. Pressure switch shunts loudspeaker voice coil when phone's picked up. Price: $2.25.

RCA-Whirlpool Miracle Kitchen on display at the show makes much use of electronic controls. Central console (including a color tv) permits milady to cook, wash dishes, clean the floor, call the grocer, keep an eye on the kids, watch tv—all without moving. Wave-of-the-hand capacitance switches open and close cabinets. R-f equipment cooks the meals, ultrasonics does the dishes.

Navy Sees $$ Rise

OFFICE of Naval Material has completed its annual report on the electronics industry for calendar year 1956 with planned production figures for 1957.

Report shows production planned by the industry for 1957 is $8,533,600,000 of which $4.2 billion will be for the military. Military proportion of total output is expected to be about the same as last year.

Sales of electronic products in 1956 increased about $700 million over 1955, to a total of $7.1 billion. The Navy estimate last year for 1956 was $7.4 billion, within 4 percent of the actual figure. Navy predictions have come within 5 percent of actual production through the years, sometimes as close as 2 percent.

Military blacklog as of Jan. 1, 1957 was $4.9 billion up from about $4 billion on Jan. 1, 1955.

About $4 billion of the 1957 backlog is in prime contracts. About $900 million is in military subcontracting, slightly down from last year.

The 1956 total sales billing figure of $7.1 billion exceeds sales billings in the peak Korea year of 1953 by about $600 million.

Ideas Abound in Medicine

- **Doctors, electronic engineers work together closely**
- **What's needed is more development, more interested firms**
- **Electronic anesthesia, data processing wanted**

WANTED by doctors: device for electronic anesthesia for brain and other surgery, possibly by electrodes attached to nerves.

That's what a noted surgeon told IRE's professional group on medical electronics. It's one of many ideas that doctors and electronic engineers can work out together.

There are many other areas in which medical electronic device development is clearly needed. Among the needs are:

• Blood-flow measurement. Electronic means would eliminate going into a blood vessel, and accompanying pain or discomfort.

• Sensory devices, including scanning equipment for the blind.

1957 should see a big increase in electronic techniques in biology and medicine, says Dr. Lee B. Lusted, vice chairman of the four-year-old IRE medical electronics group. Millions of dollars are probably now being spent for electronic gear under medical research grants.

Data processing is getting hot. Electronic computers could be used for such mass-data projects as determining how effective a vaccine is or showing results of water-supply fluoridation.

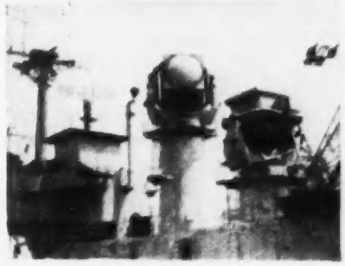
A small analog computer is now being used in basic research into nervous systems. Scientists set into the computer an equation they know holds for an electrical impulse transmitted down a normal nerve.

There are other possibilities for computers. Among possible uses:

• Analyzing and filing masses of medical information.

• Collecting specific hospital records relating to one type of disease for analysis both of the disease

TECHNICAL changes to watch



• **Ready** for kickoff of International Geophysical Year, July 1, Bureau of Standards staffer calibrates field-intensity recorder (upper, right). Device is part of world warning net to foretell solar activity—p 22.

• **Long-range,** high-altitude radar type SPQ-5 (lower, right) guides Navy's Terrier missile. Radar can scan many miles beyond horizon, select individual targets from tight groups. Two cruisers, *USS Boston* and *Canberra*, now carry Terriers. *USS Topeka*, *Providence* and *Springfield* are being converted.

• **Radio** signals bounced off meteor trails help Stanford Research Institute engineers communicate between Menlo Park, Calif. and Bozman, Montana. In past, hams have used method but SRI men report getting intelligible messages through.

• **Instrument** by Naval Ordnance Lab measures number, kind and mobility of electrical carriers on transistor's surface. Researchers are also studying effects of magnetic fields. Work on germanium is about wound up, next comes silicon. One outcome of work: transistors may no longer have to be hermetically sealed, NOL asserts.

and treatment. This may become an active field in the next few years.

• Use of computer to study function of one of the body's systems, such as nervous or cardiovascular system.

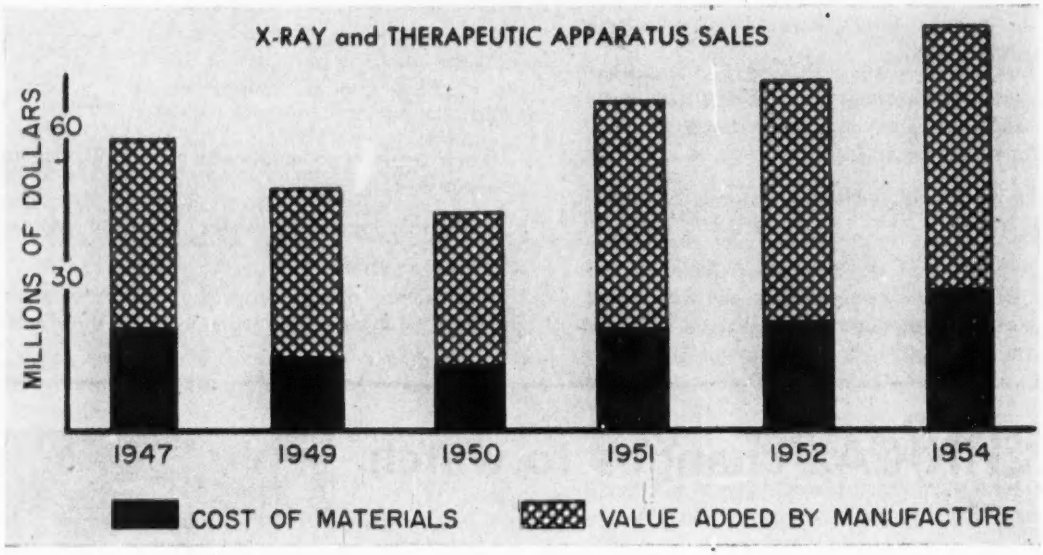
Medicine, says Dr. Lusted, needs more and more measuring equipment. Take, for example, a doctor who might want a nerve stimulator for nerve function studies. He would need an electronic device that puts out a pulse of a certain wave shape and duration.

Much medical electronic equipment now is built on a one-shot or limited quantity basis. Medical researchers give work to graduate electronic students, small companies and interested engineers who make instruments as a sideline.

Some medical foundations have their own electronics shops for routine needs, call on universities or companies for special instruments or advice.

Many firms now in medical electronics view it as a field in which they can make valuable humanitarian contributions, add to their prestige. Some now hope only to break even in undertaking development of apparatus.

PRODUCTION and SALES



X-ray Sales Climb Steadily

MANUFACTURER'S sales of x-ray and therapeutic apparatus totaled $80 million in 1954, the Census Bureau recently disclosed. At time of last Census in 1947 sales were $60 million.

Between 1947 and 1950 sales declined more than $15 million, to $44.4 million. Since 1950 they have climbed steadily.

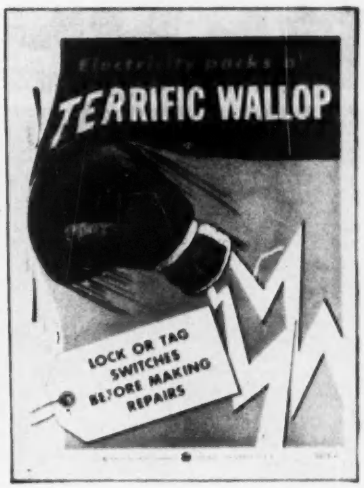
There has been only a small change in ratio of cost of materials to value added by manufacture over the eight-year period. Cost of materials, which represented 34 percent of total value in 1947, moved up to 36 percent by 1954.

• **Transistor** sales in 1957 are running far ahead of 1956, RETMA reports. In the first two months 3.2 million transistors with a factory value of $9.3 million dollars were sold. These figures compare with 1.2 million transistors valued at $3.6 million sold in Jan.-Feb. 1956.

• **Department of Defense** military electronic expenditures for first half of fiscal year 1957 exceeded $1.5 billion, RETMA estimates. Second-quarter expenditures were $903.7 million, up from $632.6 million in first quarter.

Breakdown by budget category of military electronics expenditures for first half of fiscal 1957 follow:

Aircraft electronics	$566.0
Ship and harbor craft electronics	36.0
Combat vehicle electronics	3.0
Support vehicle electronics	1.2
Missiles guidance	421.0
Communications	366.0
Research & Development	142.1
Miscellaneous	1.1
Total	$1,536.4



Posters, employee contests help . . .

Safety Programs Save Profits

Electronics pays share of $3.5-billion annual all-industry accident loss

Employee-management safety-hazard inspection committees popular

Lower accident records reduce hidden costs, insurance premiums

Electronics manufacturing is safer than most industries and getting still safer. Disabling accidents are scarce, but cuts, scratches and minor eye injuries run up accidents costs. And many small firms in our industry are especially vulnerable to accident loss. Few can afford a safety engineer.

The National Safety Council figures indirect costs are half industry's $3.5-billion overall annual accident loss bill. Each hour lost directly means four hours lost while other employees help or look, damage is repaired, machines are down or replacements trained.

Methods used by electronics firms to control accident hazards:

• Leeds and Northrup backs up a safety engineer with a management committee on special hazards and a safety committee in the elected employees council. The employees' committee investigates and makes recommendations. The interest of employees is whetted by posters and contests.

• **Thomas Electronics has had employee-management committee active daily for three years. It has found its insurance firm helpful in solving problems.**

• Kearfott has a safety committee with membership rotated on all working levels. Each committee inspects departments other than those of the members. An insurance representative is a member.

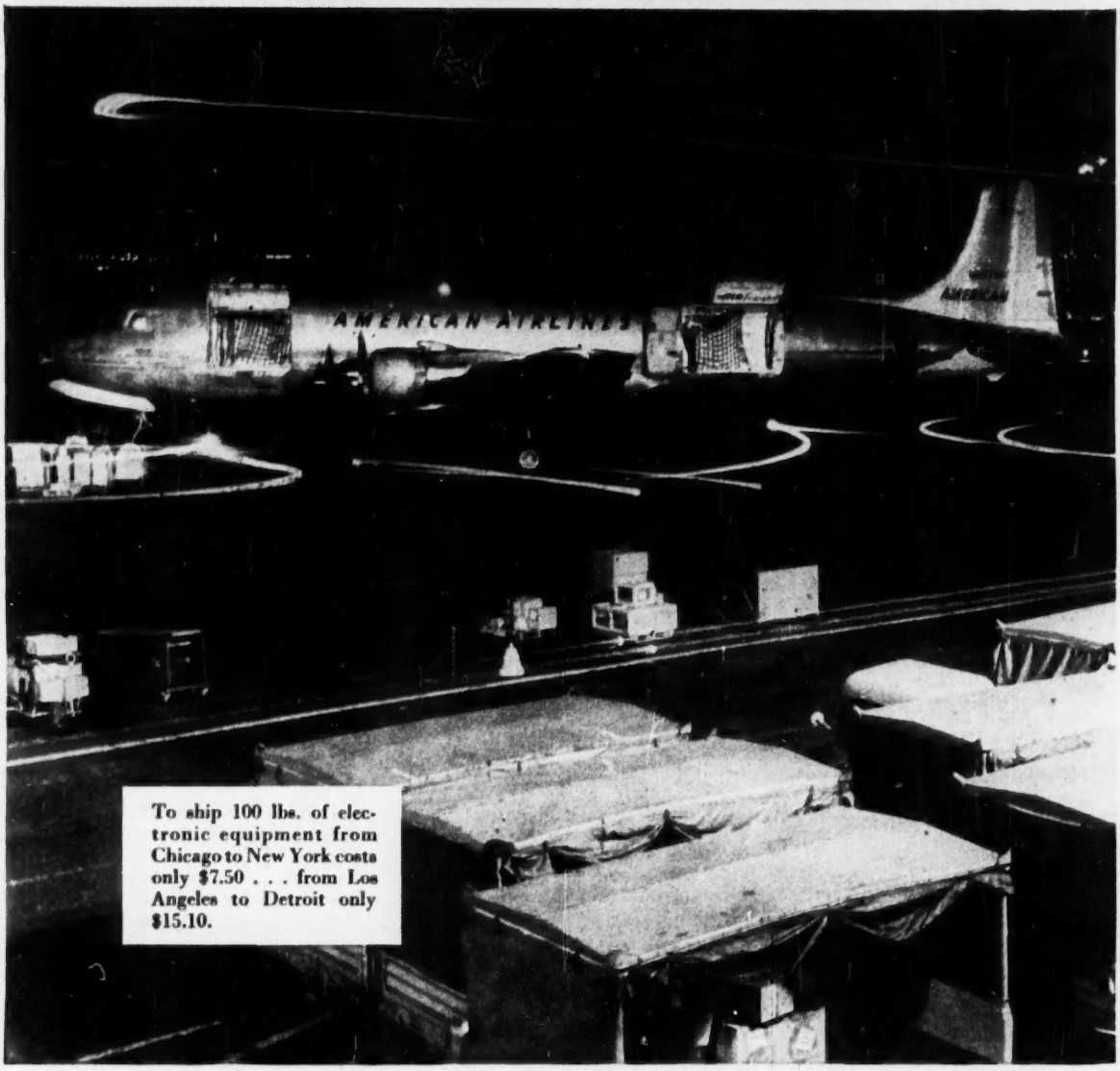
• Westinghouse radio-tv division scored almost 20 million man-hours without disabling injury in its former Sunbury, Pa., plant. It is seeking to reestablish the record at its new plant in Metuchen, N. J. The safety program has been given a full-time head.

Each supervisor appoints a safety observer and both are trained in safe practices. Plant management serves on a safety policy committee. Supervisors are appointed to committees dealing with specific problems.

Agreement is general in our industry that a safety program materially reduces costs, particularly workmen's compensation insurance premiums. Plant safety records affect the premium rate for the succeeding year. Rating organizations are considering a plan to refund part of the premiums paid by plants with good records.

Generally, a 1,000-employee plant needs a safety engineer. From 1,000 to 250 employees, firms usually hire a consultant or combine safety job with plant security, personnel relations. In smaller shops, an employee can handle details of an established program part time. Insurance firms or National Safety Council give ideas on setting up a program.

DEPENDABILITY



To ship 100 lbs. of electronic equipment from Chicago to New York costs only $7.50 . . . from Los Angeles to Detroit only $15.10.

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Tape Links Office Systems

- **GE sends Social Security data electronically**
- **System cuts work, costs, error**
- **Needed: common language, safeguards**

"WHAT we have here are two similar computers several hundred miles apart talking to each other without an interpreter." Charles deCarlo, IBM's director of applied science, so describes General Electric's direct transmission of tape-recorded data to the Social Security Administration in Baltimore.

GE, taking advantage of the fact that its Schenectady, N. Y., divisions and the Bureau of Old Age and Survivors Insurance both use IBM 705's, simplifies preparation of its quarterly Form 941 for the Federal agency.

With a slight variation in computer program, GE produces a taped report to SSA specifications. Tape is mailed to Baltimore, becomes input to SSA's computer. Eventually, says Comptroller Gerald Phillippe, Social Security information for most of GE's 280,000 employees will be forwarded on tape.

Industry thinks this procedure holds great promise. Conceivably, tapes containing job materials data can go from purchasers to vendors, be used by vendors for ordering, billing, inventory control, production planning—all as one automatic procedure. Tape-recorded engineering specs supplied by vendors for an end-product can be integrated into a computed "model" by the producer. Aircraft designs can be test-flown, for example, before subcontracts are let.

Divisions of some companies already file reports on paper tape, magnetic tape or cards. Computer-makers are confident that all this will ultimately be done on magnetic tape. Errors in transcription, time needed for reprocessing, costs for paper and people all drop.

Commenting on the possibilities of the procedure, an SSA official says, "what's needed most of all is a standard machine language. They tell us translators are in the works to let us handle other tapes besides IBM's, but we haven't seen them yet."

SSA states that International Harvester, Westinghouse, Firestone and Esso are among other big employers who have looked into the possibility of sending in their 941's on tape. "We've had no trouble with the tapes—none whatsoever," says SSA's Roy Smith; "we'd be glad if more employers could file on tape."

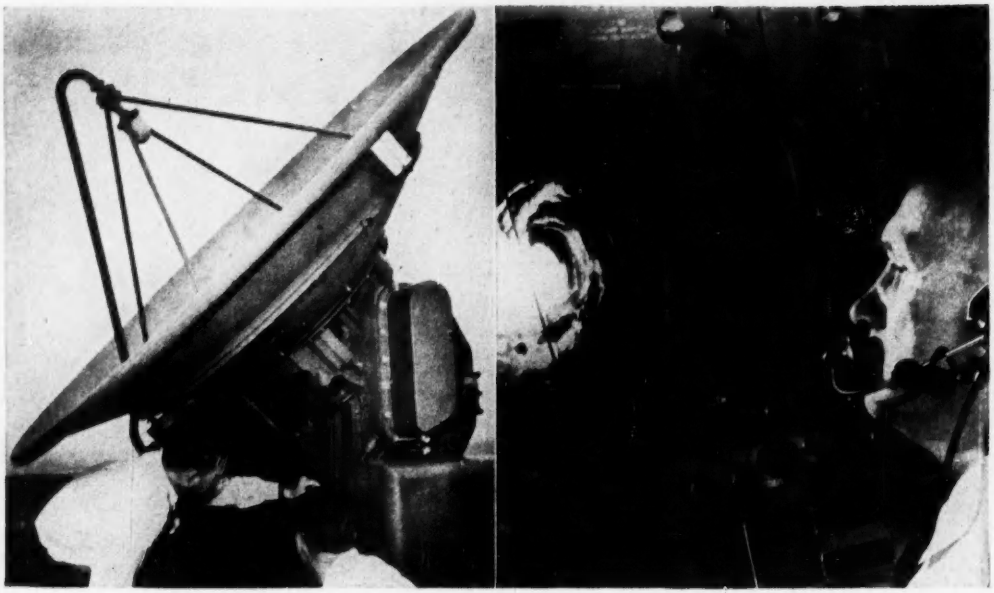
The agency estimates that 10 percent of all employers hire 70 percent of the 68 million workers with active social security accounts. "If this 10 percent had electronic computers and could integrate their payroll systems with our reporting," says Swift, "it would mean substantial savings for them and for us."

Accountants, corporation comptrollers and other fiscal watchdogs have begun to accept taped records even as they accepted punched cards. Validity of tape as a permanent record has been tested in one Federal court and upheld.

A Philadelphia lawyer says "it's a matter of time. Eventually people will accept the idea of computers dealing directly with each other. We'll need controls and safeguards, of course."

Spotting Shimmy

Electrified screwdriver connected with a compact electronic amplifier detects and measures wear in bearings, gears, spindles or slides by sensing noise energy. Instrument is made by Sperry Products of Danbury, Conn. Information is displayed on a calibrated meter or fed to a loudspeaker for aural interpretation



Radar zeroes in on hurricane as . . .

Electronics Probes Weather

- **Bureau spends annual $2 million on research gear**
- **Radar networks and computers analyze storm activity**
- **Electronics definitely practical for forecasting**

"WE MAY achieve climate," once said O. Henry with his tongue stuck firmly in his cheek, "but weather is thrust upon us." Science's attempts to ease the pain of the thrust by predicting where and when it might come are beginning to put dollars in our industry's pockets.

Last year the Weather Bureau alone spent $2 million on electronic gear for weather research. Expenditures by industrial researchers are harder to measure, probably doubled the figure.

Records Center in Asheville, N. C., the Weather Bureau has installed $5-million worth of computing gear. Says Commerce Secretary Weeks of weather forecasting by electronics: "definitely practical."

Other data-handling systems are at the Numerical Weather Prediction Unit and the Meteorological Research Center in Suitland, Md., and at the three records-processing stations in Chattanooga, San Francisco and Kansas City.

Bureau deputy chief D. M. Little sees an increas-

tect and count lightning strokes may eventually cover the globe.

The Bureau has 54 50-kw radar stations keeping watch on the tornado and hurricane country, with 20 more coming shortly. Three megawatt stations watch the Atlantic from Nantucket, San Juan and Cape Hatteras.

During the summer of 1958, Raytheon will begin delivering 31 500-kw S-band radar sets, convertible to C or X band. This $4-million package will replace some of the coast installations, which will in turn go inland to tornado country. Ultimate aim: 150 storm-tracking radar installations covering the U. S.

The Weather Bureau has also given Servo Corp. a $1.3-million contract for 40 radio theodolites, used to track weather balloons. Upwards of 60,000 radiosonde sets, costing $20 each, are used by the Bureau each year. Says one Bureauman: "Navy and Air Force use a potful of them too."

X-rays Televised

TELEVISED viewing in color of ordinary x-ray negatives is possible with a system announced last week by Philco. The EXICON (Expanded Image Contrast) system promises to be a valuable tool for radiologists searching x-rays for traces of cancer by:

Increasing from two to ten the number of gray x-ray tones that can be easily distinguished by the eye. Important information in small areas of low contrast x-ray negatives has often been hard to find.

Improving readability of the ten gray tones by converting them to color hues, ranging from red for transparent sections of the x-ray to blue for opaque portions.

Magnifying a 6 by 8 in. negative to twice its size on any number of 17-in. screens and permitting close-ups of any part of the negative in gray or color hues.

Philco says first monochrome model will be marketed about July 15 for $29,500, expects that it will take time for radiologists to get accustomed to ten grays before working with color. Color converter will boost system's cost 10-15 percent.

Of long-range significance is possibility that much of EXICON'S tv circuitry may be adapted to fluoroscopy. Magnified fluoroscope images in color tv may enable speedy, mass cancer detection. Other possible applications of the technique are under study for air traffic control, aerial reconnaissance and in connection with x-ray inspection in industry, says Philco.

Standard 3-gun 5 in. cathode ray tube is heart of flying spot scanner. Lens system focuses ultraviolet spot on x-ray negative. Multiplier phototube amplifies light that passes through negative, converting it to video signal. Signal then goes to contrast-enhancing device, to black-and-white monitor and finally, through color monitor.

Technical DIGEST

• **Two** quartz crystals propagating ultrasonic signals in mercury delay line are used by Mullard to simulate aircraft ghosts, for testing new tv receiver circuit designs. One unit gives variable time delay up to 330 microseconds simulating television signal reflected from aircraft overhead.

• **New** electron-tube cold cathode developed by Brown Boveri in Switzerland requires no heating of tube envelope even down to

used and grating holes are small, according to NBS Boulder Labs. Chief usefulness is in vhf band.

• **New** safety delay for VT fuzes, developed jointly by NOL and Sylvania, is expected to replace clock-type delays in proximity-fuzed shells. Unit uses mercury in upper of two chambers separated by porous material to short out two wire leads and make projectile safe. After firing, acceleration forces mercury through porous disk to lower chamber, unshorting wires, arming fuze.

• **Color-translating** ultraviolet mi-

• **For** 500 C applications, Bendix has found that a metal envelope provides better heat radiation than can be obtained with ceramic or other refractory envelope. Maximum radiation is achieved by using monel metal envelope as anode, brazing it to a molymanganese coating on alumina ceramic stem.

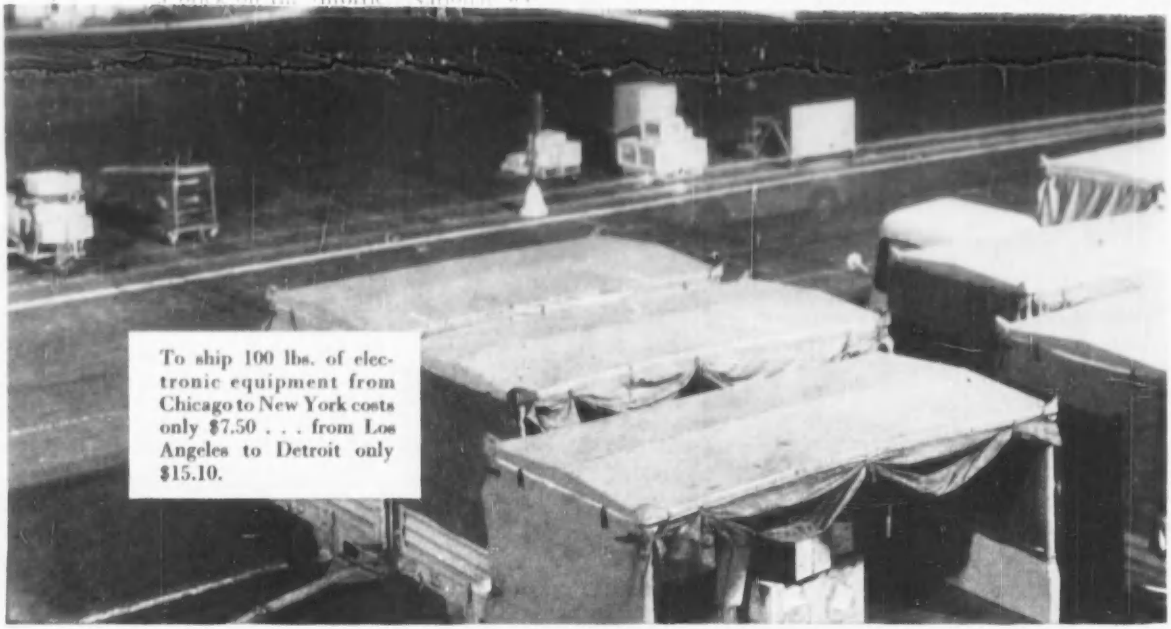
• **For ship-to-shore** voice communication during total darkness and radio silence, the Navy is now being equipped with AN/SAT-2 infrared transmitting sets. These work in the infrared spectrum between 0.75 and 1.2 microns wave-

Last year the Weather Bureau alone spent $2 million on electronic gear for weather research. Expenditures by industrial researchers are harder to measure, probably doubled the figure.

This year and next, with the International Geophysical Year coming up, research programs will be [illegible] back on the throttle. National Sci-

Weather Prediction Unit and the Meteorological Research Center in Suitland, Md., and at the three records-processing stations in Chattanooga, San Francisco and Kansas City.

Bureau deputy chief D. M. Little sees an increasing public demand "for forecasts at all hours, for more accurate and more detailed forecasts, and for forecasts that cover longer advance time periods."



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Specify American Airlines Airfreight—the carrier that offers the best assurance of expert handling and on-time deliveries. American offers this greater dependability because American leads all other airlines in experience, capacity, coverage of key cities and frequency of schedules.

AMERICAN AIRLINES AIRFREIGHT

—flies more freight than any other airline in the world

• **New** electron-tube cold cathode developed by Brown Boveri in Switzerland requires no heating of tube envelope even down to −40 C, withstands arc voltages of over 25 volts. Absence of semiconducting layer on base metal contributes to much higher emission

firing, acceleration forces mercury through porous disk to lower chamber, unshorting wires, arming fuze.

• **Color-translating** ultraviolet microscope permits viewing medical, chemical or metallurgical slides on color tv screens. In new version

and radio silence, the Navy is now being equipped with AN/SAT-2 infrared transmitting sets. These work in the infrared spectrum between 0.75 and 1.2 microns wavelength.

• **Automatic synchronizer** developed by Victoria Iron Works

tape as a permanent record has been tested in one Federal court and upheld.

A Philadelphia lawyer says "it's a matter of time. Eventually people will accept the idea of computers dealing directly with each other. We'll need controls and safeguards, of course."

With a slight variation in computer program, GE produces a taped report to SSA specifications. Tape is mailed to Baltimore, becomes input to SSA's computer. Eventually, says Comptroller Gerald Phillippe, Social Security information for most of GE's 280,000 employees will be forwarded on tape.

Industry thinks this procedure holds great promise. Conceivably, tapes containing job materials data can go from purchasers to vendors, be used by vendors for ordering, billing, inventory control, production planning—all as one automatic procedure. Tape-recorded engineering specs supplied by vendors for an end product can be integrated into a computed "model" by the producer. Aircraft designs can be test-flown, for example, before subcontracts are let.

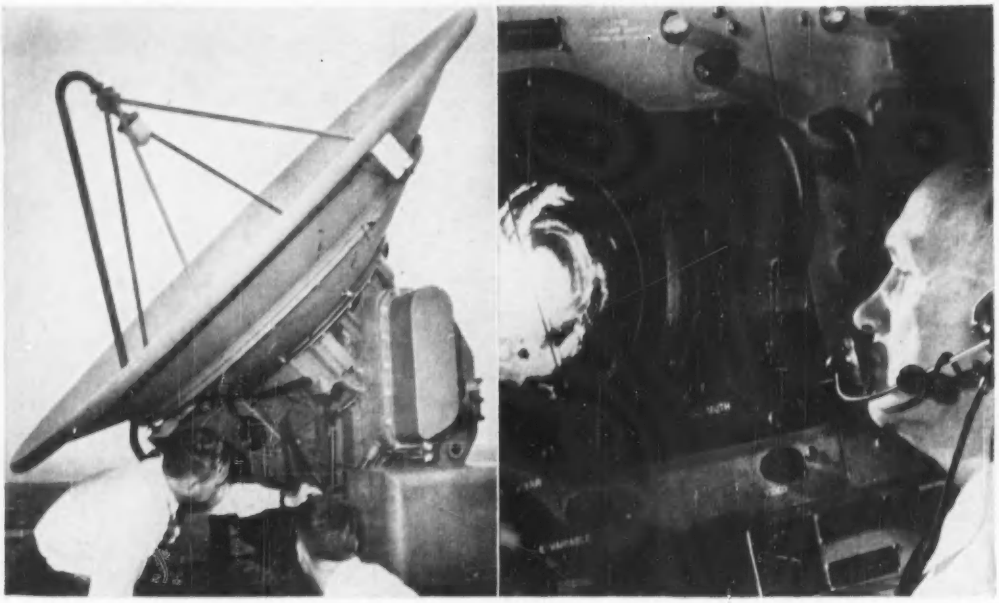
Divisions of some companies already file reports on paper tape, magnetic tape or cards. Computer-makers are confident that all this will ultimately be done on magnetic tape. Errors in transcription, time needed for reprocessing, costs for paper and people all drop.

Commenting on the possibilities of the procedure, an SSA official says, "what's needed most of all is a standard machine language. They tell us translators are in the works to let us handle other tapes besides IBM's, but we haven't seen them yet."

SSA states that International Harvester, Westinghouse, Firestone and Esso are among other big employers who have looked into the possibility of sending in their 941's on tape. "We've had no trouble with the tapes—none whatsoever," says SSA's Roy Smith; "we'd be glad if more employers could file on tape."

Spotting Shimmy

Electrified screwdriver connected with a compact electronic amplifier detects and measures wear in bearings, gears, spindles or slides by sensing noise energy. Instrument is made by Sperry Products of Danbury, Conn. Information is displayed on a calibrated meter or fed to a loudspeaker for aural interpretation



Radar zeroes in on hurricane as . . .

Electronics Probes Weather

- **Bureau spends annual $2 million on research gear**
- **Radar networks and computers analyze storm activity**
- **Electronics definitely practical for forecasting**

"We may achieve climate," once said O. Henry with his tongue stuck firmly in his cheek, "but weather is thrust upon us." Science's attempts to ease the pain of the thrust by predicting where and when it might come are beginning to put dollars in our industry's pockets.

Last year the Weather Bureau alone spent $2 million on electronic gear for weather research. Expenditures by industrial researchers are harder to measure, probably doubled the figure.

This year and next, with the International Geophysical Year coming up, research programs will be running with a brick on the throttle. National Science Foundation has granted $1.45 million to the Weather Bureau for its part in the IGY program. Of the $39 million so far allocated for IGY, at least half is for research affecting our knowledge of the weather.

Just to handle the analysis of the 300 million punched cards full of data at the National Weather Records Center in Asheville, N. C., the Weather Bureau has installed $5-million worth of computing gear. Says Commerce Secretary Weeks of weather forecasting by electronics: "definitely practical."

Other data-handling systems are at the Numerical Weather Prediction Unit and the Meteorological Research Center in Suitland, Md., and at the three records-processing stations in Chattanooga, San Francisco and Kansas City.

Bureau deputy chief D. M. Little sees an increasing public demand "for forecasts at all hours, for more accurate and more detailed forecasts, and for forecasts that cover longer advance time periods."

Electronic gear used today includes radar observatories which track storms, transosondes which travel halfway around the world at a specified altitude while sending data home. Telemetering gear goes aloft in jet planes and rockets, this year will probe space in the Vanguard satellites.

Networks of direction-finding equipment to de-

tect and count lightning strokes may eventually cover the globe.

The Bureau has 54 50-kw radar stations keeping watch on the tornado and hurricane country, with 20 more coming shortly. Three megawatt stations watch the Atlantic from Nantucket, San Juan and Cape Hatteras.

During the summer of 1958, Raytheon will begin delivering 31 500-kw S-band radar sets, convertible to C or X band. This $4-million package will replace some of the coast installations, which will in turn go inland to tornado country. Ultimate aim: 150 storm-tracking radar installations covering the U. S.

The Weather Bureau has also given Servo Corp. a $1.3-million contract for 40 radio theodolites, used to track weather balloons. Upwards of 60,000 radiosonde sets, costing $20 each, are used by the Bureau each year. Says one Bureauman: "Navy and Air Force use a potful of them too."

X-rays Televised

TELEVISED viewing in color of ordinary x-ray negatives is possible with a system announced last week by Philco. The EXICON (Expanded Image Contrast) system promises to be a valuable tool for radiologists searching x-rays for traces of cancer by:

Increasing from two to ten the number of gray x-ray tones that can be easily distinguished by the eye. Important information in small areas of low contrast x-ray negatives has often been hard to find.

Improving readability of the ten gray tones by converting them to color hues, ranging from red for transparent sections of the x-ray to blue for opaque portions.

Magnifying a 6 by 8 in. negative to twice its size on any number of 17-in. screens and permitting close-ups of any part of the negative in gray or color hues.

Philco says first monochrome model will be marketed about July 15 for $29,500, expects that it will take time for radiologists to get accustomed to ten grays before working with color. Color converter will boost system's cost 10-15 percent.

Of long-range significance is possibility that much of EXICON'S tv circuitry may be adapted to fluoroscopy. Magnified fluoroscope images in color tv may enable speedy, mass cancer detection. Other possible applications of the technique are under study for air traffic control, aerial reconnaissance and in connection with x-ray inspection in industry, says Philco.

Standard 3-gun 5 in. cathode ray tube is heart of flying spot scanner. Lens system focuses ultraviolet spot on x-ray negative. Multiplier phototube amplifies light that passes through negative, converting it to video signal. Signal then goes to contrast-enhancing device, to black-and-white monitor and finally, through color monitor.

Technical DIGEST

• **Two** quartz crystals propagating ultrasonic signals in mercury delay line are used by Mullard to simulate aircraft ghosts, for testing new tv receiver circuit designs. One unit gives variable time delay up to 330 microseconds simulating television signal reflected from aircraft overhead.

• **New** electron-tube cold cathode developed by Brown Boveri in Switzerland requires no heating of tube envelope even down to −40 C, withstands arc voltages of over 25 volts. Absence of semiconducting layer on base metal contributes to much higher emission currents than with oxide-coated cathodes.

• **Use** of wire grid reflecting surfaces for corner-reflector antennas can give essentially the same gain as continuous metal-sheet reflectors, provided sufficiently fine wire is used and grating holes are small, according to NBS Boulder Labs. Chief usefulness is in vhf band.

• **New** safety delay for VT fuzes, developed jointly by NOL and Sylvania, is expected to replace clock-type delays in proximity-fuzed shells. Unit uses mercury in upper of two chambers separated by porous material, to short out two wire leads and make projectile safe. After firing, acceleration forces mercury through porous disk to lower chamber, unshorting wires, arming fuze.

• **Color-translating** ultraviolet microscope permits viewing medical, chemical or metallurgical slides on color tv screen. In new version developed by Neutronics Research Co., Waltham, Mass., ultraviolet vidicon is illuminated sequentially through slide by three different uv wavelengths. Vidicon feed is similarly switched to three color guns of viewing tube. By choice of wavelength, malignant cells appear in one particular color on screen.

• **For** 500 C applications, Bendix has found that a metal envelope provides better heat radiation than can be obtained with ceramic or other refractory envelope. Maximum radiation is achieved by using monel metal envelope as anode, brazing it to a molymanganese coating on alumina ceramic stem.

• **For ship-to-shore** voice communication during total darkness and radio silence, the Navy is now being equipped with AN/SAT-2 infrared transmitting sets. These work in the infrared spectrum between 0.75 and 1.2 microns wavelength.

• **Automatic synchronizer** developed by Vickers uses magnetic amplifier and synchro to adjust speed of diesel-driven a-c generator to within ¼ cps in frequency and 5 deg in phase of another generator. Circuit anticipates instant of synchronism 25 cycles ahead, to allow sufficient time for the circuit breaker to close.

Tubes Break Street Traffic Jams

- **Electronic traffic signal controllers relieve city congestion**
- **Baltimore spent $500,000 for electronic equipment in 1956**
- **Hard-pressed road planners want computers to do their figuring**

CIVIL ENGINEERS have been leaning more and more in the past two years upon electronics as a partial solution to the twin problems of downtown congestion and highway planning.

The burdens being placed on road planners are heavy. Vehicle registrations are expected to climb from 65 million now to 100 million by 1970. Each engineer will have to double his productivity to meet federal and state road building proposals totaling some $52 billion.

Traffic engineers have since 1955 accepted electronic coordination of traffic signals.

Baltimore spent $500,000 last year on electronic and related equipment, part of a $4-million project. When the system is completed, Baltimore will have eight central traffic signal cycle selectors directing 1,000 secondary electronic controllers. It now has 270 radar counters at intersections and plans to have 1,200 to 1,500.

Future traffic engineers, according to Henry A. Barnes, Baltimore director of traffic, should be as well versed in electronics as in highway design. He says "a tremendous future lies ahead in the field of highway electronics."

Automatic Signal Division of Eastern Industries, Baltimore's contractor, has installed over 50 automatic master controls, a few cities use several. Seven cities have all-electronic controls and 15 are partly mechanical.

Baltimore doesn't link its system with radio because the city has an underground duct system. GE, however, has equipped Chicago, Evansville and Los Angeles with radio tone signal systems. Chicago reported radio cost one-seventh of cable. Other tone systems are going in near Boston and on Long Island. Boston parkway officials say using radio saved $100,000.

So far, electronic controls and tone signals have not been married. H. A. Radzikowski, of the Bureau of Public Roads and secretary of the American Association of State Highway Officials' radio committee, says that is just a question of time.

If the FCC will allot "proper" frequencies, he says, most of the major cities will eventually adopt tone control. The FCC is being asked to make room

RADIO-COORDINATED traffic signal in Evansville controls downtown traffic

in the 150 to 174-mc band. Civil defense, Radzikowski says, is interested in a dual voice-tone system so that emergency instructions can be broadcast through traffic signals.

Radio systems which actuate traffic signals in the path of emergency vehicles have been sold 10 cities in the past two years by Electronic Protection. Radar speed meters are commonplace, with about 1,500 in use. Remotely indicating counter-speed meter installations may help highway patrol officers open highway bottlenecks.

Closed-circuit tv is going slowly. Units have been used in a number of traffic studies. There are at least three permanent installations and four under consideration where fast knowledge of traffic blocks is needed.

Many state and federal agencies own computers for highway design calculations. Others rent computer facilities. Glenn Ryden, Arizona's computer chief, says its computer has increased engineering productivity by 100 to 150 percent.

As a Bendix engineer told a conference of highway officials: the shortage of engineers "is a beautiful situation for computer manufacturers because you people must get computers. You certainly are not going to get engineers."

electronics Editor Bill MacDonald Probes the Industry's Technical and Business Status

Despite 30 years of experience, despite a staff of 22 full-time editors, despite the parade of stories, feature-length technical articles, releases, reports and statistics that cross his desk...

"Mac" spends nearly a third of his time in the field, as shown below,* *with an executive on one side and an engineer on the other.*

That's why 46,000 important people in electronics pay to receive **electronics** 37 times a year.

And that's why advertisers buy the 37-time schedule (12 Technical Editions published on the 1st of each month, 24 Business Editions on the 10th and 20th of each month, *plus* the mid-year Buyers' Guide).

*"Mac" is flanked by Fairchild Camera & Instrument Corp. Executive Vice President Richard Hodgson (right) and Research Associate Charles Poppe (left). Equipment in the background is an Automatic Voice Data Link.

From NBS, worldwide warning as . . .

Giant Net Serves IGY

- **NBS central will warn of solar ruckus**
- **Most communications facilities take part**
- **Weather net active in U. S.**

Largest communications network ever used for scientific purposes will tie efforts of International Geophysical Year's investigators together.

IGY will start July 1 and continue through the end of 1958. It is a coordinated assault on problems of geophysics by half a hundred nations and some 5,000 scientists. During its course, scientists all over the globe will be investigating earth's interior, crust, oceans, atmosphere and surrounding space.

To make possible simultaneous observations, special alerts and world intervals will be called whenever the sun starts acting up. World Warning Agency that will call intervals is at Ft. Belvoir, Va., home of the National Bureau of Standards' forecasting center. Center also serves as Western Hemisphere Regional Warning Center.

International network includes:

- Radioteletype network of the World Meteorological Organization.
- Virtually all commercial communications facilities throughout the world.
- Military and CAA radio nets.
- WWV, WWVH and international counterparts such as Argentina's LOL and Japan's JJD.

Warning network reaches from pole to pole and into such remote areas as Himalayas and equatorial Pacific. System has been on trial one week out of each month since January, 1957.

World Warning Agency scientists will decide each day throughout IGY whether to call alert for the day following. Hour of decision is 1600 Greenwich Mean Time. Network will have word out to field stations in time to start special interval at 0001 GMT the next day.

In this country, messages will go out first over WWV and Weather Bureau's communications system. Weather stations will notify all IGY investigators in locality.

New Hotel Goes Electronic

Electronics is in the plans for $20-million Queen Elizabeth Hotel in Montreal. Being erected by Canadian National Railways, 1,200-room building will be completed in early 1958.

Here are some of the things it will contain:

Elevators, already installed, are electronically controlled. Their ups and downs are scheduled by a built-in computer. Computer also determines the number of elevators operating.

Heating and air conditioning system is also self-regulating. Keeping temperatures constant in occupied rooms, system is watched by a scanning device. Scanner rings alarm bell when it sees any heat fluctuation.

Each room will have a combination tv, a-m, public-address set. Guests will receive 6 tv channels, four radio and two hotel audio channels. Over the latter, emergency calls can be sounded whether set is on or off. An empty conduit system will be laid from public to guest rooms in preparation for the day that closed-circuit tv might be added.

Being considered for the Queen Elizabeth: electronic dimming to control lighting in all public areas.

Hotel's designers and engineers, noting that some of their countrymen speak English and no French and others French and no English, want a translation set up for conventions. They see it as similar to the United Nations translation operation. But they want it to be portable, preferably transistorized. They are still looking for it.

Service Firms Prosper

Provide ready manpower pool
And even out clients' work loads;
Help avoid morale problems

ENGINEERING-SERVICE companies grossed close to $1 billion last year, according to an estimate by Larry Gonzer, a partner in Lehigh Engineering. Probably half of all engineering service is electronics. Engineering-service firms perform a variety of functions for electronics manufacturers: engineering, designing, drafting and technical writing.

Many corporations in the electronics business find it expedient to use engineering services under certain circumstances:

- To staff a new plant quickly. Engineering service personnel can fill the gap until the company has had time to recruit permanent personnel.
- To handle temporarily heavy loads. Engineering-service personnel can be dropped without affecting morale of permanent employees.
- For one-shot projects. Personnel with specialized experience can be gotten quickly and on a temporary basis.
- Where plant facilities are limited. While waiting for the new plant to be completed, work can be done on the premises of the engineering-service firm.

There are two basic methods for using engineering services. Per-diem personnel can be brought into the plant to work with permanent employees. Some management personnel favor this approach since they have control over the service personnel. The alternate approach is to farm out tasks to the engineering-service firm. The latter course can be paid for on a cost plus fixed fee basis or, if the task is sufficiently well defined, on a lump-sum contract.

Cooperation Ups Brain Power

NEW computers are growing out of joint design-development programs.

GE's computer department is building electronic gear for National Cash Register's NCR304.

Stromberg-Carlson is putting together a readout-and-intervention system for Univac Scientific at Eglin Air Force Base, Fla.

S-C will also cooperate with Remington Rand in design and manufacture of output gear for the ultrahigh-speed LARC, soon to be delivered to the atomic research center at Livermore, Calif.

NCR's medium-sized 304, scheduled for delivery in two years, will be an all-transistor computer with high-speed magnetic-tape facilities. System will include universal converter, capable of translating from 80 to 90-column cards or paper tape to magnetic tape and back again.

Design for 304 does not yet include large-capacity data storage—a 20,000-character core unit provides both working and buffer storage—but more capacity is planned. Price, not yet announced, will be in 6-figure range.

Stromberg-Carlson's efforts come about because of its interest in Charactron storage tube. Readout systems for several computers are already installed. Delivery of quarter-million-dollar readout-and-intervention system—requiring modifications in Eglin AFB's Univac—is scheduled for this July.

How to keep informed on the "with what" part of your business

AT YOUR FINGER TIPS, issue after issue, is one of your richest veins of job information—advertising. You might call it the "with what" type—which dovetails the "how" of the editorial pages. Easy to read, talking your language, geared specifically to the betterment of your business, this is the kind of practical data which may well help you do a job quicker, better—save your company money.

Each advertiser is obviously doing his level best to give you helpful information. By showing, through the advertising pages, how his product or service can benefit *you* and *your* company, he is taking *his* most efficient way toward a sale.

Add up all the advertisers and you've got a gold mine of current, on-the-job information. Yours for the reading are a wealth of data and facts on the very latest in products, services, tools . . . product developments, materials, processes, methods.

You, too, have a big stake in the advertising pages. Read them regularly, carefully to keep job-informed on the "with what" part of your business.

McGRAW-HILL PUBLICATIONS

Baby Batteries Sell Big

- Mercury cells expand to $8-$9 million
- Newer types aim at watches, missiles
- Dry cells declining in hearing aids

BATTERY business has both ups and downs. Sales of mercury batteries, developed during World War II for tropical warfare, have climbed to $8 to $9 million annually. Sales of some other types are off.

Half of mercury cells go into hearing aids. Radios and industrial instruments use most of remainder. Transistorized portable radios are adding to sales. Electric wrist watches are using some miniature batteries. Special types have been developed for missile-borne equipment.

Latest manufacturers' surveys of primary dry battery sales were made in 1954 and 1955 by Business and Defense Services Administration of the Department of Commerce. Mercury cells, exports and semifinished batteries and components were not included.

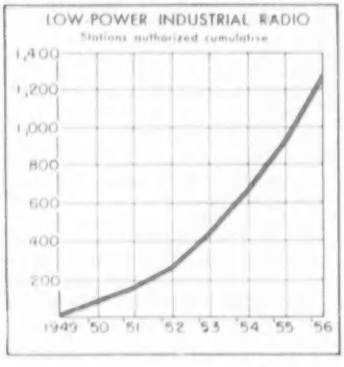
Total domestic sales were 1.5 billion batteries at $82,144,437 in 1954 and 1.4 billion at $81,887,362 in 1955.

Civilian sales rose from $58.5 million to $66 million. Of this, radio and instrument batteries accounted for $17.4 million in 1954 and $22 million in 1955. Farm radio packs were a soft spot. Rural electrification is believed accountable for a 20-percent decline during 1955.

Dry batteries sales for hearing aids dropped from $4.6 million in 1954 to $3.3 million in 1955. Hearing aid battery sales, not reported in BDSA figures, are actually rising, but mercury cells are cutting into the business, according to a manufacturer of both battery types.

Military dry battery purchases declined from $23.7 million to $16 million in years surveyed. A reason was cut in portable radio battery purchases from 376 million cells to 140 million cells.

Low-Power Transmitters Gain



LPI authorizations increase

LOW-POWER industrial radio (LPI) has scored consistent gains of 30 percent or better each year since its inception in 1949. FCC station authorizations grew from 93 in 1950 to 1,269 by mid-1956.

Authorizations for transmitter-receivers—all classed as mobile—increased from 1,692 units at the start of 1951 to 13,887 by 1956. Interest in LPI is shown in the growing number of applications received yearly by FCC. In 1950, 169 applications were made; in 1956, 663.

LPI is limited in range to about two miles. Input to final amplifier cannot exceed three watts. Newly designed units are a-m rather than f-m in anticipation of channel splitting.

Some typical installations are:

• Smith-Corona uses eight units to coordinate movement of parts and materials in its eight-story Syracuse, N. Y., typewriter plant. The company reports improved production schedules. Dispatchers no longer send men looking for in-plant trucks.

• Another installation does ship-to-shore duty in reconstruction of Piers 4 and 6 at Boston Naval Shipyard. Raymond Concrete Pile Company uses LPI to communicate with tug towing scrap to offshore burning point.

• About two dozen units are being installed in Safeway Markets' Palo Alto, Calif., warehouse, where 6.5 million pounds of food is moved weekly. Lift truck crews chopped working times 30 percent, the manager says.

• Westinghouse sometimes sent men on bicycles to find vehicles at its 57-acre plant in Sunnyvale, Calif. Now, vehicles report positions with LPI.

3-D Tv Aids British Scientists

BRITISH scientists are handling radioactive material more than a half mile away with a stereoscopic or 3-D tv system and master-slave manipulator.

The Marconi equipment consists of two vidicon cameras, two control units and two monitors. Right- and left-eye views are provided by each camera-monitor pair. Semi-silvered mirror superimposes one view on the other.

One monitor screen has a horizontal polaroid filter, the other a vertical filter. A 3-D effect is obtained when the composite image is viewed through polarized glasses.

A scientist watching the tv image can operate the Savage and Parsons master-slave manipulator by clips attached to his fingers.

OPERATOR looks at monitor of 3-D tv to follow remote manipulators. Equipment will be used for handling radioactive materials at Harwell research station of British Atomic Energy Authority

SPECIAL MARKET REPORT

TEST INSTRUMENTS

Business has quadrupled in past 10 years
Growth indicates $290 million in 1960
Guided missiles are a prime sales mover

IMPELLED by increasing emphasis on electronics in American life, industry and defense, test instrument production has quadrupled in the past 10 years.

The same technological improvements and weapons needs which are expected to drive electronics production from $6 billion to $10 billion by 1966 will carry test equipment to higher levels.

VOLUME—Census figures show a growth from $55 million in 1947 to $188 million in 1954. Manufacturers are sure that current production is well over $200 million.

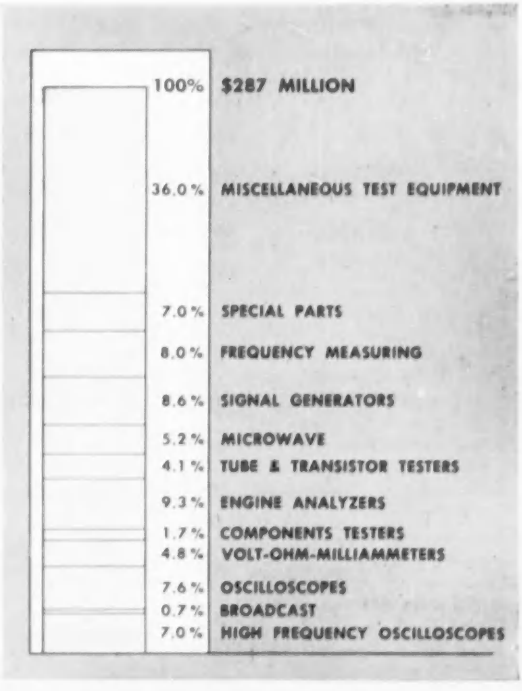
Test equipment sales will primarily rise with military and industrial electronics, manufacturers feel. Sales in these categories show some striking parallels in the years 1950-54.

Projecting test equipment production at the same rate anticipated for military and industrial electronics, the test instrument market looks like:

$220 million in 1956, $240 million in 1957, $290 million in 1960, $330 million in 1963 and $390 million in 1966. This is conservative in comparison to a straight-line projection of the census figures, which would result in a 1966 estimate of $440 million.

BREAKDOWN—The market breakdown table shows the shape of the market according to the 1947 and 1954 censuses. The 1957 and 1960 projections allow for expected shifts in electronics industry patterns.

DEFINITION—There is another way of looking at the general-purpose test instrument market: count



TEST EQUIPMENT SALES 1960

only instruments used to test electronic devices, exclude specialized test equipment.

The Department of Commerce surveyed the field in 1956 using that restricted definition. Even so, it came up with a total of $157 million and a growth rate of 15 percent a year.

• The man who supervised the commerce survey recently estimated 1957 production in this area at $200 million. His own firm's sales climbed 25 percent in 1956.

• Another large manufacturer reports a sales gain of 32 percent between fiscal 1956 and fiscal 1957. Others have gains less steep.

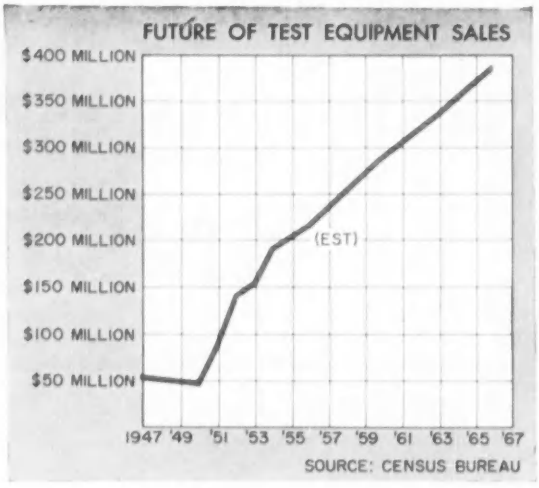
• A recent entry into the field reports 1956 sales 400 percent over 1955, and expects 1957 sales will be double 1956.

MILITARY—No manufacturer of a variety of instruments questions the importance of military electronics. Military contracts are a prime instrument market. One manufacturer says a cutback in military appropriations would create market saturation.

Direct sale to the military is an important market, but not the dominant one, as shown by the table indicating military-type instrument production by years.

While this Department of Commerce survey covered only general-purpose instruments, it pointed out that military use of special-purpose instruments is widespread. Mass production of missiles, requiring checkout gear, is expected to multiply this market.

R & D—A prior ELECTRONICS survey showed that electronics engineers have, on the average, access to $2,800 worth of test equipment. Almost half of these men are engaged in research and development.



Estimated R&D investment in the electronics industry was $743 million in 1953 and $823 million in 1954. This was one-fifth of all U. S. industry research, according to the National Science Foundation. Small firms in electronics did more research than small firms in other industry.

Government expenditures in R&D, the Foundation reports, grew from $1 billion in fiscal 1950 to an estimated $2.6 billion in fiscal 1957. Planned military development work totals almost $3 billion in 1957, including $1.87 billion for missiles.

INDUSTRIAL—Another growing market for electronic test equipment depends upon industrial instrumentation and control.

Control Engineering, a McGraw-Hill publication, showed that 372 firms in this field spent $30.1 million on electronic and other instruments in 1956. Most intended to increase or equal these purchases in 1957.

Oscilloscopes top the list of test instruments used most often by instrumentation firms. Electronic

TEST EQUIPMENT MARKET BREAKDOWN

(millions of dollars)

Type of Equipment	1947	1954	1957	1960
High frequency oscilloscopes	0.77	7	14	20
Other oscilloscopes and oscillographs	4	16.5	19	22
Volt-ohm-milliammeters	3.3	8	10	14
Tube and transistor testers	2	5.8	8.5	12
Components testers	1.7	3.2	3.8	4.5
Microwave test equipment	2.5	8.5	11	15
Signal generators	3.8	15.2	20	27
Broadcast test equipment	*	1.6	1.7	1.9
Radio frequency measuring	1.8	13.8	20	23
Engine analyzers	15.2	23.2	25	27
Other test equipment	10	68.2	90	105
Parts for test equipment	0.5	11.4	15	20

* not available

MILITARY-TYPE INSTRUMENT PRODUCTION

(millions of dollars)

	1951	1952	1953	1954	1955	Early 1956	Totals
Voltage & current measuring	0.3	1.0	2.5	0.1	0.3	0.1	4.3
Frequency	10.8	8.0	1.0	8.3	1.4	1.7	31.2
Impedance & swr	0.2	0.1	0.1	0.6	0.4	0.1	1.5
Power & electromagnetic field	2.3	4.9	1.1	0.4	1.7	0.2	10.6
Waveform measuring	7.2	4.3	1.8	0.1	1.3	0.3	15.0
Signal generators	14.7	14.8	4.2	4.4	4.8	0.9	43.8
Active network instruments	0.1	1.5	1.3	0.9	0.1	...	3.9
Passive network instruments	0.2	0.1	0.3	0.4	0.1	...	1.1
Totals	35.8	34.7	12.3	15.2	10.1	3.3	111.4

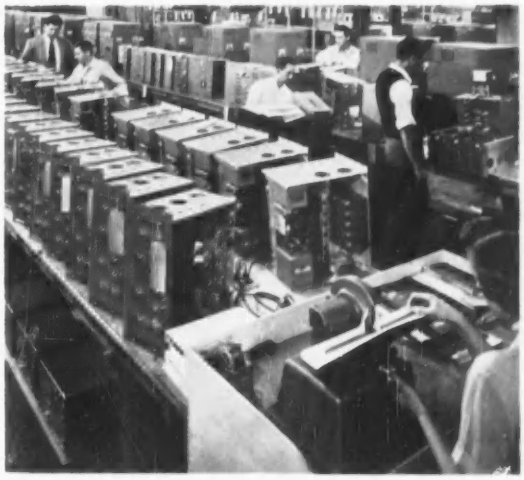
Average rate: $21,000,000 per year
Average rate—1953-55: $12,500,000 per year

counters, signal generators, vacuum-tube voltmeters, audio oscillators and frequency meters are near the head of the list.

SHAPE—The Commerce Dept. survey covered 262 firms making testers for electronic use in 1956.

Three firms with over 500 employees grossed $31 million; 11 firms with 150 to 500 employees, $41 million; 37 firms with 50 to 150 employees, $30 million; 89 firms with 15 to 50 employees, $30 million, and 22 firms with less than 15 employees, $12 million. It was indicated that 81 of the 262 companies depended on test equipment for over half their business.

SERVICING—Home-equipment servicing is one of the few test instrument soft spots, although radio and tv type instruments still account for about $14 million production. The level has dropped slightly in the past year. The situation is considered temporary, could easily be reversed by expansion of color television.



PULSE GENERATORS line up for inspection as test-instrument manufacture shifts into high gear. Increased industrial and military work gives push

FUTURE—The patterns of growth in both military and industrial electronics indicate that more and more money will be spent for special-purpose test and measuring equipment. The guided-missile program is a major factor.

Wind tunnels, static test stands and research laboratories all require test equipment. Factories need special setups to check guidance systems and subsystems as they come off the production lines. Highly specialized checkout equipment must accompany missile units in the field.

Use of electronic computers likewise broadens the potential for specialized test equipment. In many such units, any of the plug-in circuits used in the computer can be plugged into the diagnostic test gear and in an extremely short time subjected to nearly every set of conditions possible in service. Thus defective circuits are often identified before they can cause computing errors.

Perhaps the ultimate in test equipment will come when each piece of electronic equipment is furnished with its own checkout device built right into its circuits. Experimentally, units have been built that not only locate trouble but even predict, by increasing electron-tube voltages, which tubes are ready to fail so that they can be changed in advance.

The advent of the transistor opens a new field in truly portable test equipment. Units such as frequency meters, signal generators and certain specialized pulse test gear used to be used only in the laboratory. This often meant delay in servicing while equipment was dismantled. The transistor makes it feasible to make complex test instruments small enough for the technician to carry to the equipment. Furthermore, the transistor's long life and ruggedness further reduce maintenance problems.

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Hand skills pay off as . . .

Puerto Rico Beckons

Taxless operation lures companies
But high profits, 33% in 1955, draw too.
Cheap skilled labor available

Puerto Rico is luring large and small electronics firms with tax savings, cheap labor and high profits. Since 1950, 44 U.S. companies have established electronics and related manufacturing plants on the island. Reasons:

- U.S. companies in Puerto Rico pay no federal corporate taxes. If a firm's net profit after U.S. tax is $29,500, it would be $50,000 in Puerto Rico. U.S. net profit of $53,500 would swell to $100,000 in Puerto Rico, $245,000 to $500,000.

- Most new plants get ten years exemption from Puerto Rican taxes.

- Profit on sales of electronics and allied products in 1955 was 33 percent, compared to 9 percent before and 5 percent after taxes for firms in the U.S.

- Average hourly wage for 2,400 electronics workers is 85 cents an hour. Worker productivity runs 75-114 percent of U.S. worker productivity, depending on type of operation and length of training time.

- Needlework tradition of Puerto Rican women is ideal for electronics assembly. Eleven vocational schools turn out 6,500 industrial trainees of all kinds each year. Some 85,000 Puerto Ricans are unemployed, 160,000 work only part-time.

West Coast electronics firms often find it economical to produce in Puerto Rico, use relatively inexpensive ocean transport for easy access to Gulf and East Coast markets. About 90 percent of Puerto Rico's electronics output goes to U.S., amounting to $20 million in 1956.

Small electronics firms as well as large ones fare well. For example, in February, Lloyd J. Hughlett started Modular Systems, Inc., his third Puerto Rican electronics operation since 1953, supplementing his Rectifier Corp. and American Coil Co.

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Pentagon Speeds Missiles

Contractors to get money quicker;

GEF delivery speeded up;

Seek industry ideas

PENTAGON Manned Aircraft Study Group is putting into effect detailed measures to cut time now taken designing, testing and producing planes, electronic equipment, guided missiles and other weapons systems.

Plans call for simpler contracting procedures and design specifications; more authority, longer tours of duty for managers of weapon development programs; and faster consideration of new ideas.

The Defense Dept. has already set up a program to speed up development of electronic systems where lead-time may be much longer than development of the airframe itself. The committee comments: "In the past, delays in weapon-system development of up to three years have been caused by late availability or lack of reliability in such long lead-time items."

To simplify procurement, the committee proposes early release of funds to the contractor so that he can begin tooling up and procuring long-lead-time facilities, components and materials. This means development contractors have a new lever for getting government money in advance for top-priority projects. Faster delivery of government-furnished equipment—like certain electronic systems—to airframe producers and other prime contractors is planned.

- Navy is now making funds available to contractors when experimental contracts are signed.
- Air Force has simplified its system for picking design contractors—past performance and current resources are major hallmarks.

Two or three selected companies are given preliminary design contract through mockup. Contractor whose design shows greatest promise is told to go ahead with the prototype. Pentagon says this technique has saved time and avoided waste of engineering manpower, while maintaining realistic industry competition.

The Pentagon has set up procedures to push through processing of applications by contractors for new tools and facilities. Air Materiel Command and the Navy's Bureau of Aeronautics can now approve plant and equipment projects up to $500,000 on their own.

Finally, military services now negotiate supply and facility contracts at the same time when possible. That is, production schedules for the end-item and plant and equipment requirements are ironed out simultaneously.

As additional means to cut development time, the committee recommends:

- Senior military officers be named to manage development projects through design, testing and volume production phases. To insure this continuity of top-level attention, tours of duty should be three to five years.
- Better long-range planning organizations be set up in the services to define new weapon needs.
- Steps be taken to seek out all sources of ideas for new weapons and components, especially ideas of industry research and design experts.

MILITARY electronics

- **Fifth** tactical missile group to be formed by the air Force is equipped with TM-61B Matadors. Group is located at Orlando AFB, Fla.

- **Sylvania's** electronic flash approach system (EFAS), installed at March AFB, Calif., and at several civilian fields, is called by SAC's Commander, Gen. Old, "a pilot model for the hundreds of AF bases throughout the world."

Each EFAS unit includes an xenon-filled lamp. Two rectifiers provide 2,000 volts d-c to charge main capacitor. Relay connected to central timing device discharges smaller capacitor through transformer to provide high-voltage trigger pulse to discharge main capacitor. Duration of each flash is 1/5,000 second.

- **Dayton** Air Force Depot is operating a large-scale Remington Rand Univac electronic computer for controlling inventory of parts used in USAF ground and airborne electronic equipment. Stocked items currently have a total value of approximately $4 billion.

CONTRACTS awarded

Fairchild Camera and Instrument gets $1,000,771 subcontract with IBM for SAGE components.

Bendix will supply AF with central air-data computers amounting to $7¼ million for installation in Republic's F-105 and McDonnell's F-101B. Another contract with Rome AFB for radome ancillary equipment amounts to $682,323.

Convair gets $47 million AF contract for F-106B all-weather interceptors, sister ship to delta-wing F-106A for which $216 million worth of contracts were announced

in January. Both weapons, said to carry highly sophisticated armament and fire-control systems, will be produced at Convair's San Diego plant.

GE's work on guidance for Atlas is formalized by an $83 million contract with AMC. Contract includes extensive additional work, as well as overtime payment for past two years.

Hughes will get $1,016,687 from AMC for spare parts for armament controls systems for F-84, F-86 and F-89 interceptors.

Hoffman Laboratories will sell radio equipment to Navy amounting to $18,633,572.

Maico gets $286,216 contract with Navy Bureau of Aeronautics for telemetering kits.

RCA will sell single-sideband transceivers amounting to $134,175 to Navy Bureau of Ships.

Reeves gets $243,925 contract with ARDC for range extension kits for AFMTC Model II tracking radar and components. Equipment will be used at Patrick AFB.

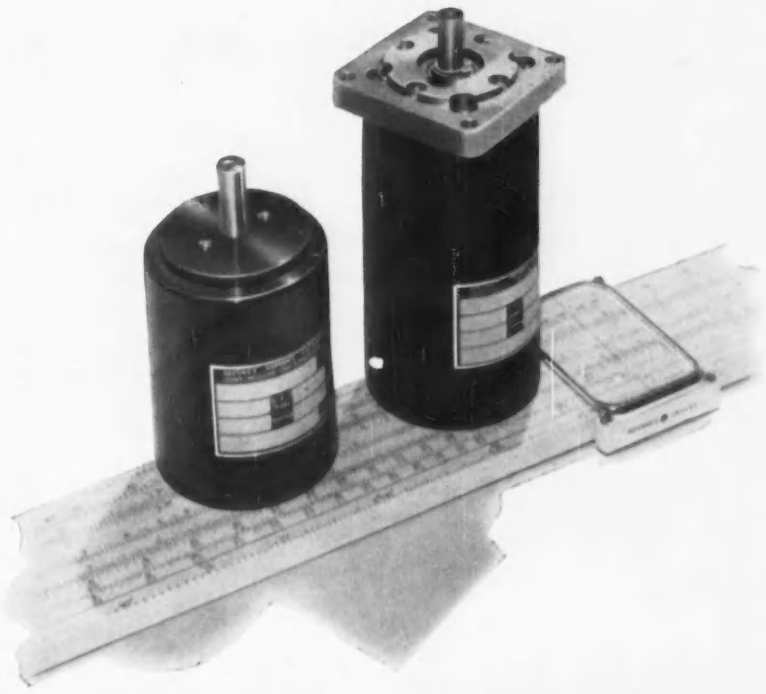
Lewyt will supply Rome AF Depot with 24 coordinate data monitors, OA-947/FST-1, under a $208,800 contract.

Raytheon gets two contracts: $869,750 with Electronics Supply Office for microwave and power tubes; and $521,627 with Boston Ordnance District for electron tubes and magnetrons.

Philco gets $1,985,919 contract with AMC for AC&W on-site maintenance for Eastern and Western Air Defense Forces.

Page Communications will receive $235,207 from AMC for additional work on improvement of ionospheric scatter communication facilities in NEAC area.

Times Facsimile will sell to Navy Bureau of Ships 84 facsimile recorder sets under a $515,541 contract.



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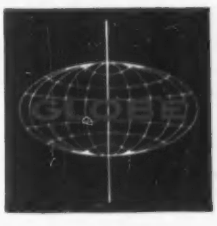

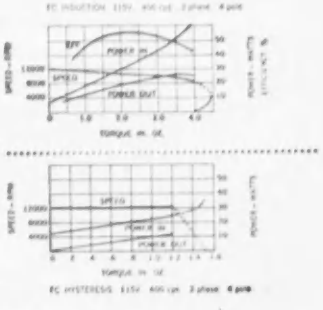

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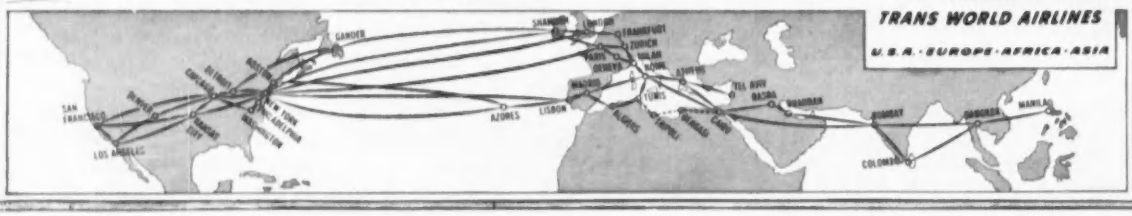
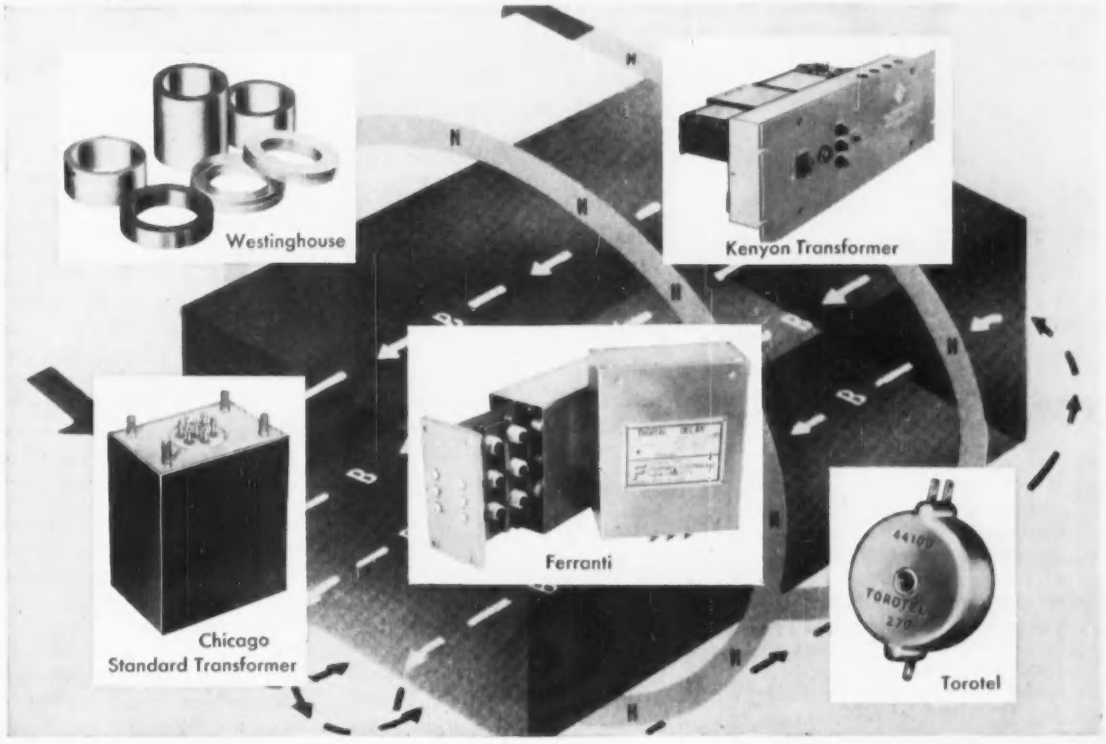


Magnetics Lead New Products



Reliability Is Key

RELIABILITY is an important characteristic of magnetic devices leading to their use in electronic equipment. Saturable transformers for magnetic amplifiers are announced by **Chicago Standard Transformer** (P 1). Lumped-constant electromagnetic networks, available from **Ferranti** (P 2) for digital storage, have up to 30-bit capacity at rates up to 5 mc.

Called Hipermag, **Westinghouse's** (P3) magnetic cores are available for magnetic amplifiers, transductors and current transformers. Molded toroids available from **Torotel** (P4) are said to withstand environmental requirements of government specifications. Magnetic a-c line-voltage regulators, developed by **Kenyon Transformer** (P5) for protection of industrial electronic equipment, feature small size, low weight, fast response time and self protection against overloads.

Other Products

Pitch controls are offered by **Mitchell** (P6) to supplement the magnetic-direction and roll controls of their autopilot system for executive and private aircraft. . . . Called spiral wrap, **Illumitronic Engineering's** (P7) polyethylene tubing cut into a spiral pattern can be used to wrap wire into cables up to 2 inches in diameter. . . . **Tur-Bo Jet Products** (P8) announces coils designed to operate in temperatures between −68 and 260 C.

Oscilloscopes offered by **Advanced Electronics** (P9) feature modular construction with interchangeable amplifiers and sweeps. . . . D-c stored-energy welders are announced by **Raytheon** (P10) for welding of vacuum tubes, relays, contacts. . . . Servomanometers are available from **Exactel Instrument** (P11) in five standard ranges from 32 to 120 inches with readouts in inches, centimeters, millibars or microns.

Frequency standards developed by **National Company** (P12) feature output stability of one part in a billion and provide 5, 10 and 100-mc outputs. . . . Noninductive video dummy loads produced by **Levinthal Electronic Products** (P13) are available with fixed resistances of 5 to 200 ohms.

Radionics' (P14) model TWM-2A timing generator produces triangular waves for establishing a crystal-controlled time-base sweep raster for oscilloscopic presentation of one-shot phenomena. . . . Thermistor temperature probes available from **Rosemount Engineering** (P15) for aircraft and missile applications are said to withstand vibration requirements of MIL-E-5272, procedure I, extended to 2,000 cps.

Ultrasonic therapy generators

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made by **Dakon Tool & Machinery** (P16) have hermetically sealed transducers for underwater treatment. . . . Called the Cardmatic, **Hickok's** (P17) new tube tester selects correct voltages from punched cards. . . . **Electronic Products'** (P18) dip-soldering machine is offered for production of circuit boards. . . . Extreme stability and low noise are claimed for **Video Instruments'** (P19) differential d-c amplifier.

Size 11 synchros are produced by **John Ostar Mfg.** (P20) with operating temperature ranges from −65 to 400 F. . . . Humidity test chambers with temperature control tolerances of ± 2 F between zero and 200 F are available from **Environmental Equipment** (P21).

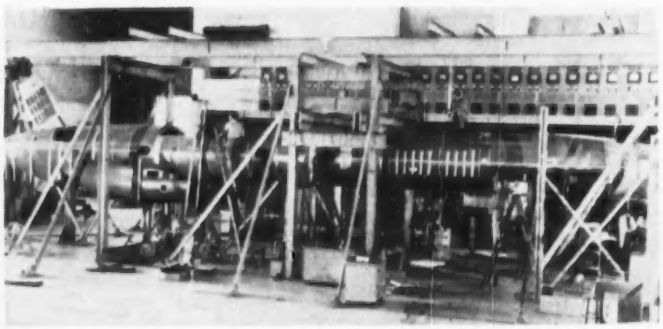
Electro Impulse Laboratory (P22) offers radio-frequency calorimeters with frequency range from d-c to 4,000 mc and power-measuring range from 10 to 150 watts. . . . Ohmmeters with a range of 0.1 to 25 ohms and an accuracy of 3 percent of full scale are announced by **Simpson Electric** (P23). . . . Ultrasonic-transmission test sets have been developed by **Radionics** (P24) to measure ultrasound attenuation and velocity of propagation in liquids or solids at frequencies from 900 kc to 6 mc.

Two-gun post-deflection accelerating cathode-ray tubes by **20th Century Electronics** (P25) are said to have deflection sensitivities of one volt per 0.25 mm. . . . **Amplifier Corp. of America** (P26) announces constant-output amplifiers which maintain constant voltage output at frequencies from 40 to 1,000 cps within 1 db. . . . Transistorized amplifiers announced by **Venner Electronics** (P27) are said to have a response flat within 3 db from 120 cps to 10 kc.

Derivative voltmeters are available from **Miljan** (P28) to measure low rates of voltage change in industrial process controls and drift and precession rates in gyroscopes. . . . **Offner Electronics'** (P29) data amplifier designed to amplify transducer signals features infinite common mode rejection and zero drift. . . . Low-level d-c voltages from thermocouples and strain gages are displayed in digital form by **Non-Linear Systems'** (P30) voltmeter.

Frequency measurements from 3 to 100,000 cps in nine ranges are possible with **Cubic's** (P31) transistorized frequency meter. . . . **Burroughs** (P32) has developed a pulse calibrator to measure current and voltage pulse amplitudes, durations and rise times. . . . The sleeve monopole antenna offered by **Mark Products** (P33) is said to maintain a vswr of 1.5:1 or better on a 50-ohm line from 148 to 174 mc.

Precision resistor networks designed for computers by **General Resistance** (P34) split 600 volts into two parts within 0.01 percent over temperature range of zero to 100 C. . . . Plastic tubular capacitors are announced by **Pyramid**



Warming up Snark Missile

ARDC personnel give Snark guided-missile its structural tests. Saturable-reactor recorders on balcony control temperatures which simulate aerodynamic heating at high speeds

Electric (P35) for printed circuits. . . . **Amperex** (P36) offers the 6939, a twin tetrode for uhf transmitter applications said to deliver 5.5 watts at any frequency up to 500 mc. . . . Electrolytic level switches developed by **Corning** (P37) indicate level and deviation from level within tenths of degrees.

Wind-recording systems designed by **Beckman & Whitley** (P38) are claimed to maintain accuracies of 4 percent of full scale for wind speed and 3 percent for wind direction. . . . Wide-band video amplifiers are announced by **Instruments for Industry** (P39) for use as preamplifiers in conjunction with frequency counters or as post amplifiers for noise-figure measurement. . . . **Jacobs Instrument** (P40) produces tapped delay lines with characteristic impedances from 50 to 2,000 ohms and delays from 2 to 200 microseconds.

Choppers designed by **Bristol** (P41) have an external coil to eliminate capacitive coupling between contact and coil leads and reduce noise in high-impedance circuits. . . . Crystal ovens to house 1, 2, 10 or 15 crystals are designed by **Bulova Watch** (P42) in military CR types with subminiature HC-18/U holders. . . . Portable vibration-testing instruments are announced by **International Research & Development** (P43) for discovering vibration and establishing acceptable tolerances in production and maintenance.

Nacimco Products' (P44) a-c to d-c converters for measuring, recording and telemetering applications handle inputs from 10 cps to 200 kc. . . . Called Kleentrol, **R-Columbia Products'** (P45) cleaning and lubricating solvent has been designed specifically for use in electronic switches, relays and controls.

The type 6800 r-f power amplifier and oscillator triode has been designed by **Amperex** (P46) for such industrial services as induction and dielectric heating. . . . Ultrasonic cleaners with operating frequencies of 40 kc are offered by **Gulton Industries** (P47) for in-

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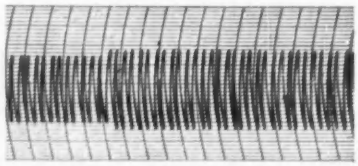
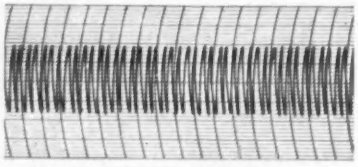


Output of typical electromechanical regulator in response to step change in input voltage. Average correction rate of 6v. per sec.



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Electronic Component & Instrument Sales Department

ELECTRONICS DIVISION
CURTISS-WRIGHT
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dustrial cleaning of small precision parts. . . . A voice-operated relay announced by **Miratel** (P48) can be applied wherever audio signals are used for control. . . . Analyzing transients on oscilloscopes should be facilitated with a sweep-operated relay offered by **Engelhardt Engineering** (P49).

Pure water for cleaning transistors and tube parts is supplied by **Penfield's** (P50) point-of-use demineralization system. . . . **Philco** (P51) offers the Transac electronic computer for use in research laboratories and universities.

New Product Makers

P 1: Chicago Standard Transformer, 3501 W. Addison St., Chicago 18, Ill.
P 2: Ferranti Electric, 30 Rockefeller Plaza, New York 20, N. Y.
P 3: Westinghouse Electric, P.O. Box 2278, Pittsburgh 30, Pa.
P 4: Twotel, 11505 Belmont, Hickman Mills, Mo.
P 5: Kenyon Transformer, 840 Barry St., New York 59, N. Y.
P 6: Mitchell Industries, Municipal Airport, Mineral Wells, Tex.
P 7: Illumitronic Engineering, 689 E. Taylor, Sunnyvale, Calif.
P 8: Tur-Bo Jet Products, 124 S. San Gabriel Blvd., San Gabriel, Calif.
P 9: Advanced Electronics, 2625 Pontius Ave., Los Angeles 25, Calif.
P10: Raytheon, 100 River Street, Waltham 54, Mass.
P11: Exactel Instrument, 5345 Eva Ave., Los Altos, Calif.
P12: National Co., Malden, Mass.
P13: Levinthal Electronic Products, 780 Stanford Industrial Park, Palo Alto, Calif.
P14: Radionics, Burlington, Mass.
P15: Rosemount Engineering, Rosemount, Minn.
P16: Dakon Tool & Machinery, 1836 Gilford Ave., New Hyde Park, N. Y.
P17: Hickok Electrical Instrument Co., 10527 Dupont Ave., Cleveland 8, Ohio
P18: Electronic Products, 322 State St., Santa Barbara, Calif.
P19: Videc Instruments, 2349 Sawtelle Blvd., Los Angeles 64, Calif.
P20: John Ostar Mfg., Racine, Wis.
P21: Environmental Equipment, 169 Linden St., Brooklyn 27, N. Y.
P22: Electro Impulse Laboratory, 208 River St., Red Bank, N. J.
P23: Simpson Electric, 5200 W. Kinzie St., Chicago 44, Ill.
P24: Radionics, Burlington, Mass.
P25: 20th Century Electronics, King Henry's Dr., New Addington, Croydon, Surrey, England
P26: Amplifier Corp. of America 398 Broadway, New York, N. Y.
P27: Venner Electronics, Kingston By-Pass, New Malden, England
P28: Miljan, Paramount, California
P29: Offner Electronics, 5320 N. Kedzie Ave., Chicago, Ill.
P30: Non Linear Systems, Del Mar Airport, Del Mar, Calif.
P31: Cubic, 5575 Kearny Villa Rd., San Diego 11, Calif.
P32: Burroughs, 1209 Vine St., Philadelphia 7, Pa.
P33: Mark Products, 6412 W. Lincoln Ave., Morton Grove, Ill.
P34: General Resistance, 577 E. 156 St., New York 55, N. Y.
P35: Pyramid Electric, 1145 Hudson Blvd, North Bergen, N. J.
P36: Amperex Electronic, 230 Duffy Ave., Hicksville, N. Y.
P37: Corning Glass Works, Corning, N. Y.
P38: Beckman & Whitley, 913 E. San Carlos Ave., San Carlos, Calif.
P39: Instruments for Industry, 150 Glen Cove Rd., Mineola, N. Y.
P40: Jacobs Instrument, Bethesda 14, Md.
P41: The Bristol Co., Waterbury 20, Conn.
P42: Bulova Watch, Woodside 77, N. Y.
P43: International Research & Development, 797 Thomas Lane, Columbus, Ohio
P44: Narmco Products, 2300 National Ave., National City, Calif.
P45: R-Columbia Products, Highwood, Ill.
P46: Amperex Electronic, 230 Duffy Ave., Hicksville, N. Y.
P47: Sutton Industries, 212 Durham Ave., Metuchen, N. J.
P48: Miratel, 1050 Dionne St., St. Paul, Minn.
P49: Engelhardt Engineering, 38 Burritt Ave., South Norwalk, Conn.
P50: Penfield Mfg., 10 High School Ave., Meriden, Conn.
P51: Philco, 4900 Wissahickon Ave., Philadelphia, Pa.

Predict Low-Power Tv Gain

- **Complete packages available**
- **Prices range from $45,000**
- **Educational market looks good**

TELEVISION will follow expansion pattern set by a-m radio, some broadcast equipment makers are betting. They expect to see the nation covered by low-power tv stations serving limited areas.

Backing their prediction, they are marketing 250-watt vhf station packages, complete down to theatrical makeup kits. Prices range from $45,000 to $60,000, depending on studio equipment. Uhf kilowatt stations cost slightly more.

Most present tv stations operate at maximum authorized power to reach the most listeners. However, some broadcast equipment makers, remembering popularity of community-oriented radio stations expect tv to follow same pattern.

Small investment and inexpensive operation of low-power tv stations are attractions.

Operation of low-power tv will cost broadcaster $85,000 a year, Sarkes Tarzian Inc. estimates. For a radio station owner to expand into low-power tv would only cost $60,000, thinks Dage Television. Expenses would be cut by doubling up on personnel and facilities.

Market for low-power tv during past three years has been armed forces. They have low-power stations from the Aleutians to Iceland.

Dage, which sold more than 20 low-power stations to the services, sees large market opening up in educational broadcasting.

Some universities, hesitant about six-figure price tag on conventional gear, now see low-power as a way to get on the air.

Ralph Steetle, director of Joint Council on Educational Television, thinks low-power "is the answer for the educator with a tight budget."

FCC actions

• **Proposes** opening frequencies 157.35 and 161.95 mc to shipboard and coast stations.

• **Gives** medical and veterinarian colleges same privileges in Special Emergency Radio Service as individual doctors and veterinarians.

• **Will** set up new services: Local Government Radio Services, Interstate Highway Radio Service, Manufacturers Radio Service, Business Radio Service.

• **Plans** changing name of Power Radio Service to Utilities Radio Service.

• **Expects** to end Motion Picture and Relay Press Radio Services access to space in 450-460 mc range and in new split channels above 152 mc.

• **Amends** f-m allocations in New England area. Among other moves, commission substitutes channel 271 for 236 in Worcester, Mass., channel 290 for 291 in Hartford, Conn.

• **Revamps** rules governing industrial heating equipment. It hopes this will end harmful interference problems caused by industrial, scientific and medical equipment.

• **Gets** kicks from tv broadcasters involved in recent Commission deintermixture moves. GE, channel 6 licensee in Schenectady, N. Y., protests on 18 counts.

• **Pooh-poohs** rumor that military intends making a grab for tv broadcasting channels 2-6.

• **Proposes** to tighten rules on translator tv station grants. Intends to refuse translator permits in areas already having a commercial television station, put them off the air when commercial station enters area.

• **Opens** hearings for its study of spectrum above 890 mc. Witnesses range from Operational Fixed Microwave Council to National Association of State Foresters.

• **Suspends** making decision in toll-tv until congressional questions on subject are answered.

STATION moves and plans

KRCO, Prineville, Ore., plans power jump to 5 kilowatts, new transmitter.

KCLO, Leavenworth, Kan., intends to increase power, change type of transmitter, install directional antenna.

KOBY, San Francisco, Calif., plans change in studio location, installation of new transmitter.

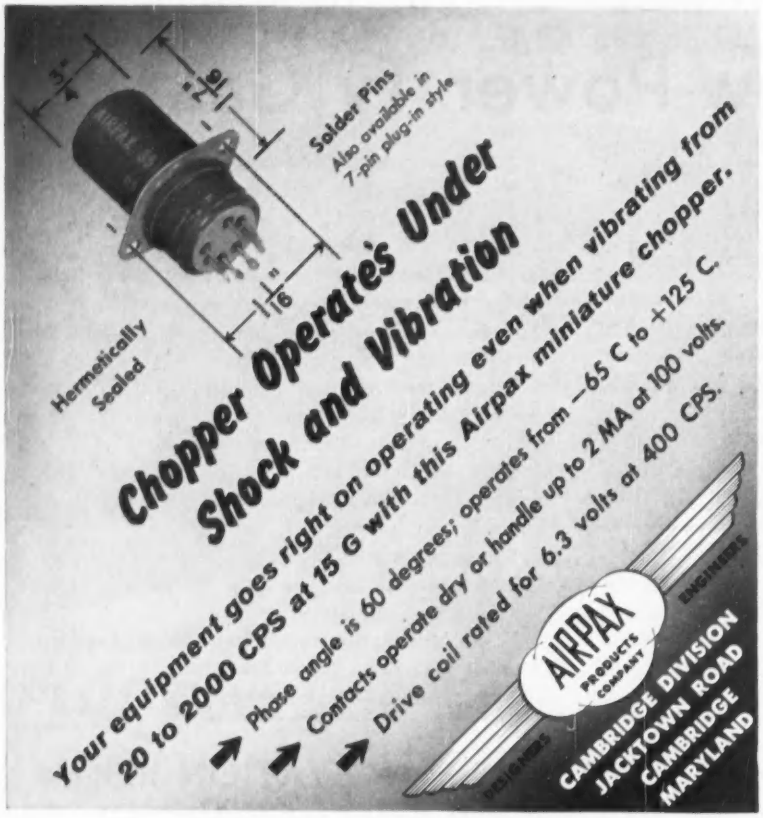
WWHG, Hornell, N. Y., increases power five-fold to 5 kilowatts.

KXYZ, Houston, Tex., is sold by Shamrock Broadcasting to Houston Broadcasting for $600,000.

KEYT-TV, Santa Barbara, Calif., is sold by Santa Barbara Broadcasting and Television to Key Television for $1.4 million.

KSDO, San Diego, Calif., plans doubling power to 10 kilowatts, new transmitter.

KRGI, Grand Island, Neb., control passes from Robert L. Lester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and friends to Grand Island Broadcasting for $145,000.

KFH, Wichita, Kan., installs new transmitter.

WNKY, Neon, Ky., plans new transmitter, power boost.

WISN-TV, Milwaukee, Wis., plans to originate own live color shows when new studios are completed this summer.

WKTV, Utica, N. Y., installs 50,000-watt transmitter.

WBKB-TV, Chicago, Ill., readies new $1.5-million studios. Facilities are designed for quick conversion to color broadcasting.

WBRC and WBRC-TV, Birmingham, Ala., are being sold by Storer Broadcasting to Radio Cincinnati. Price is $6,350,000.

WWCO, Waterbury, Conn., plans to install new transmitter.

ABC television network expects to have exclusive tv station affiliates in every market with a population over ½ million come next Fall.

WHTN and WHTN-TV, Huntington, W. Va., plans to spend $40,000 on new studios and equipment.

KXGI, Fort Madison, Iowa, increases power from 500 watts to 1 kilowatt.

KBAM, Longview, Wash., plans to install new transmitter, jump power to 5 kilowatts.

KWBB, Wichita, Kan., plans new transmitter.

WIBA, Madison, Wis., installs new transmitter.

KVDO-TV, Corpus Christi, Tex., now belongs to South Texas Telecasting. Former owner Coastal Bend Television gets $94,300 for station.

KRGV, Weslaco, Tex., is sold to KRGV Television Corp. by Taylor Radio and Television for $101,133.

Etched Circuits Grow in '57

Manufacturers see $20-million business

If guided-missile production soars.

Radio-tv sales begin to stabilize

ETCHED CIRCUIT makers see continued growth in 1957. Market expectations for fabricated boards range from $16 to $20 million this year, compared with $14 to $18 million in 1956.

Top figure is based on hope newer missiles will break through from prototype to production this year.

Tapering advances are seen in radio and tv. Percentage of sets using printed circuits can grow from 75 to 90 percent. But circuit boards are getting smaller.

Circuit boards are branching into other consumer goods. One auto maker substituted boards for dashboard wiring this year; another firm is reported putting printed circuits in air filters.

Estimates of number of solidly established firms specializing in circuit boards go no higher than 10, as low as four.

About 110 firms offered printed circuits in 1956, 10 more than 1955. But only 70 firms stayed in the business throughout 1955. Thirty manufacturers dropped out and 40 joined, including some large diversified companies.

Observers say some entries and exits are due to expectations of a huge market. Market has only partially materialized because largest consumers, radio and tv producers, are making many of their own boards. Some are also competing for outside orders.

One executive said his firm could not have stayed in the business without strong capital backing. It takes time to develop the diverse skills required for printed circuit manufacture, aside from investment in engineering talent and equipment, he says.

A third reason given for the ups and downs in the business is that the field is settling down. Production scene is changing from job shops to volume producers. One source expects volume users to contract for boards, just as radio-tv manufacturers do for many components.

Remote Meters May Save $$

HOME WATER meter readers may find their chores eased by telemetering. A device to relay basement meter readings to outside indicators is being tested by Cleveland's Department of Utilities.

Two models are under consideration. An electronic one uses a transistor pickup, would be powered by 35-cent battery replaced every four years. An all-electrical model uses telephone wire.

Stephen J. Suhajcik, Cleveland's commissioner of fiscal control, estimates the system would save the city $250,000 a year. Reading would be speeded up five times. The meters themselves must be kept in basements to avoid wintertime freeze-ups.

The electronic pickup would be used, Suhajcik says, if any objections were raised to installation of telephone wire.

Earl Benjamin, president of Welded Construction Engineering Co., developed the device. It is a variation on remote indicators made for the Air Force. New firm, Electro-Meter, headed by Benjamin, would handle the project.

Benjamin is working on another device which would print reading on tape to be torn off by meter readers. Indicators for an entire block, he says, could be housed in street-corner panels. Water consumption of large industrial users could be read at City Hall.

BRITONS view screen as . . .

Railroad Rolls With Television

IN BRITAIN they've hit on a gimmick to get more passengers on the railways—entertain with closed-circuit tv.

An order has been placed by British Railways with Pye for equipment for one train, with receivers mounted at both ends of nine coaches to serve 600 passengers.

Equipment includes miniature industrial camera, five-inch video monitor, eighteen 17-inch receivers, four-foot audio rack, four-way mixer, 50-watt amplifier, tape deck and 27 speakers. First use will be on excursion trains.

Programs will consist of light entertainment, interviews, occasional scenic views with a commentary. Recorded programs and film may be possible too.

Pye's Scottish representative looks beyond the novelty and the shores of Britain. Says W. J. Kennett:

"Industrial tv offers to railways a chance to increase revenue. . . . It also offers export potential, particularly in countries where they have never seen tv, in Africa for instance."

Diesel generator provides power for equipment. "Studio coach" will have dressing rooms and a commentator's box.

British Rushing Transistors

- **One million units seen for 1957**
- **Eight firms in keen scramble**
- **Wary of U. S. competition**

EIGHT major British firms are rushing transistor production, and they're wary of each other.

Best estimate puts 1956 British industry-wide transistor sales at 500,000 units valued at $840,000. Estimates for 1957 range from one to ten million transistors, with one million considered by many to be most realistic. This would amount to about $1.7 million.

One British industry source asserts there's widespread secretiveness about transistor production and sales, explains it this way:

"Every manufacturer is sitting on the fence because demand here hasn't met level expected. Each is afraid to give a competitor a lead that might enable him to step into a limited field and corner the market. What's more, there are some items which manufacturers talk about which, in effect, don't exist."

Added to domestic competition is plan of Texas Instruments to enter the British market.

Britain is at least two years behind advanced U.S. firms in the transistor field, some sources admit. That's the stated reason for reluctance of many Britishers to talk transistor numbers.

General Electric Co. Ltd. anticipates 1957 sales of all types of its transistors will reach 500,000 units valued at about $840,000, expects 15 percent will be exported. GE Ltd. has a new factory in production.

Reported about to enter the transistor market is Anglo-American firm Sylvania-Thorne. Philco and the British firm Plessey Co. Ltd. have formed Semiconductors Limited to make transistors and other semiconductors. New firm expects to begin production early next year. Plessey holds 51-percent interest, Philco 49 percent.

Britain's radio and tv market and increased industrial demand are likely to swell transistor production by 1958. Some observers see British sales following the upward U.S. curve, with the American-British production ratio at 10 to 1, about the same as for electron-tube sales.

Developments ABROAD

• **England's** General Electric Co. Ltd. grows 8 in. long, 771¼ oz single-crystal germanium ingot. Firm says its technique permits large crystals to be grown automatically and uniformly with big cost savings in transistors and crystal diodes. Ingot has impurities of less than one part in 20 million, is valued at $1,820.

• **German** firm Elektromedizinische GmbH. offers battery-operated electronic stethoscope equipped with transistor amplifier.

• **In London** new intrafactory communications system announced by Communication Systems Ltd. copes with high noise levels. Call button triggers all loudspeakers in the network; speak button mutes loudspeaker near microphone to avoid acoustical feedback.

• **Australia** is enlisting electronics to fight kangaroos and geese. Kangaroos are counted electronically as they converge on water holes. Kangaroo census helps hunters concentrate on most populated areas. Studies are being made of how to combat electronically more than two million geese threatening multimillion dollar rice project.

• **In England** flameproof electronic flash equipment for use with conventional cameras in potentially explosive atmospheres is offered by Ernest Turner Electrical Instruments. Weighing 58 lb with cast aluminum-silicon housing, apparatus produces repeated flashes in same bulb. Noninductive triggering circuit avoids arcing.

• **Canada's** Post Office Department is developing an electronic mail-sorting system. Names of towns, villages and streets are converted to code, marked on envelopes by special keyboard. Then high-speed sorter takes over.

EXPORTS and IMPORTS

Austria is planning to buy new radar ground control approach equipment for Vienna Airport for use in mid-1958. Airport has GCA installation for training only, wants separate surveillance and approach systems.

Britain's 44th National Business Efficiency Exhibition June 17-27 in London will feature recent advances in electronic computer design and application to office routine.

NATO members **West Germany and Denmark** purchase RCA's AN/ARC-34 uhf airborne communications equipment.

Canada's transcontinental tv network is nearing completion as final microwave link takes shape between Sydney, Nova Scotia and St. John's, Newfoundland. Link will also provide 60 voice channels for use by Canadian National Rail-

ways. Each voice channel is equal to 18 telegraph circuits. Link allows up to 120 voice channels.

British electronics engineering firm Palco Engineering Ltd., London, seeks licensing arrangement with U. S. firm to make related lines in U. K.

Scandinavian business houses including about 70,000 exporters and importers in Denmark, Norway, Sweden, Finland and Iceland are listed in 1956-57 Nordisk Handels Kalender general directory. Publication is indexed by commodities in English.

Venezuelan firm Technifot, C. A., Edificio Central, Avenida Urdaneta, Esquina Las Ibarras, Caracas, wants to obtain agency for magnetic recording equipment and parts from U. S. manufacturers.

Denmark's Posts and Telegraph Dep't. orders $252,000 worth of tv gear from Marconi. Equipment includes monitoring and test units plus flying-spot scanners for three new tv stations.

Britain's first export reactor, under construction near Sydney, Australia, will be supplied with electronic instrumentation and control circuitry by Ekco Electronics Ltd.

British carrier BOAC will equip its long-range Bristol Britannias with dual Marconi transmitter-receivers for multichannel h-f communication, high discrimination receivers and dual radio compasses.

West German tv and radio set production topped one billion marks last year, according to the Manufacturers' Association. About 3,460,000 radio sets, 550,000 tv sets and 460,000 radio-tv combination sets were made, compared with 1955 output of 3 million radios and 350,000 tv sets.

Exports of radios in 1956 were estimated at 1,560,000 against 1,290,000 the previous year. Tv set exports jumped from 27,000 in 1955 to 60,000 in 1956. Manufacturers' Association predicts production of 750,000 tv sets this year, export of at least 70,000.

Edited by DON FINK

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This book gives you a rounded view of semiconductor devices—all the help you need to prepare for practical circuit design and engineering of applications utilizing transistors, diodes, or photocells. Emphasis is on actual circuit design. The extensive section on this subject covers the use of semiconductor devices in bandpass and video amplifiers, computers, measuring instruments, industrial control equipment, oscillators, etc. In addition, theory of semiconductor devices; important aspects of how they are made; and background of analysis and measurement is given, to provide engineers with an intensive one-volume treatment of this growing new field.

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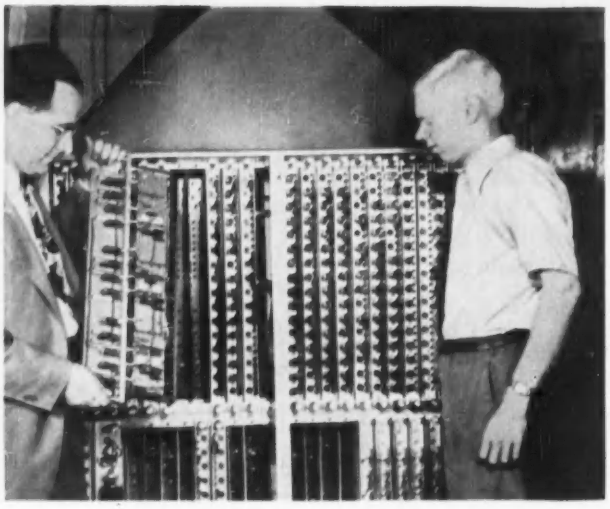

Digitronics Gets Under Way

NEW FIRM in our industry is Digitronics Corp., now operating out of Underwood Corp.'s former Elecom plant in Long Island City, N. Y. Firm is capitalized with 1-million 10-cent-par shares, not yet being publicly offered.

Formed from Elecom staff when Underwood burned off its large-computer operations, Digitronics will not besiege the computer field head on. "There's no faster way to go broke," says v-p Robert F. Shaw, "than to try to make big computers on a shoestring."

Bob Shaw and president Al A. Auerbach worked with computer-maker John Mauchly (at left in picture with Shaw) and Pres Eckert in 1950 before their Philadelphia firm became nucleus of Remington Rand's Univac division. In 1951, Shaw and Auerbach left to form Electronic Computing Corp., absorbed by Underwood in 1952 as Elecom.

Digitronics assumes Elecom's commitments for service on existing machinery and production of lumped-parameter delay lines. New company will also supply small-computer products and services to Underwood. "Backlog of these orders, and consulting work," says Shaw, "will be our main support for the time being."

The company also figures on working into computer building blocks, contract assembly work, computer auxiliaries.

Besides Auerbach and Shaw, former Underwood execs now officers of Digitronics include Elecom sales manager Norman Grieser and advanced development head Eugene Leonard. Some 70 other staffers also moved over to join the new firm.

CEC Pushes New Sites

CONSOLIDATED Electrodynamics Corp. is pushing work on two 57,500-sq ft buildings on its 33-acre site on what used to be the Monrovia, Calif., airport. Buildings will house office, lab and production facilities for CEC's transducer and systems divisions. Construction will cost $1.5 million. Plans call for operation to be finished by the end of September.

New construction, as always, means moving day. System division will vacate space in CEC's engineering and research center. Transducer operations will move in from Pasadena. New facility, housing upwards of 700 people, will double the capacity of the two divisions.

Realignment in transducer division has production manager E. J. Long moving in as assistant director for operations. His former assistant, Herbert A. Johnson, steps into the production manager's job. James C. Kyle moves up to be assistant director for engineering. He had been technical director.

CEC meanwhile is setting up a spectron division to handle development and manufacture of optical systems for missiles and instrumentation. Operations are housed in a 16,000-sq ft building in Monrovia. Present staff of 30 will double by year end. Russell L. Kiernan, former manager of industrial engineering for Texas Instruments' optics division, heads the new operation.

Ford Shuffles Line

FIVE staffers move into new jobs at Ford Instrument Co., division of Sperry Rand Corp.

Moving up from contract administration to become manager of product planning is Robert J. Seymour, who remains an assistant to the sales v-p. Edmund C. Bennett moves in as manager of production test department.

Process engineer Raymond R.

Business MEETINGS

May 26-29: National Association of Electrical Distributors, Sheraton-Park and Shoreham Hotels, Washington, D. C.

June 4-7: National Sales Executives' International Congress, Biltmore, Los Angeles.

June 6-7: Conference on Production Techniques, Willard Hotel, Washington, D. C.

June 12-14: Operations Research Conference, campus of Illinois Institute of Technology, Chicago.

Nadronza moves up to the job of chief tool engineer.

Security supervisor James J. Sullivan becomes personnel manager, and former personnel assistant Frank A. Higgins moves up to be manager of employee relations.

S-C Hires Missile Expert

MISSILEMAN Royal Weller, chief scientist at Point Mugu, leaves the Navy missile test center to become v-p for engineering of Stromberg-Carlson. No stranger to electronics, Weller will coordinate and advise all S-C engineering groups, with special emphasis on telecommunications.

San Diego operations of this division of General Dynamics also get a new chief engineer as William G. Alexander moves out west from Westinghouse Air Arm division in Baltimore. S-C's engineering v-p Andrew H. Bergeson goes home to Washington, D.C., to take over firm's office there. Bergeson, former Navy captain, will work to strengthen S-C's government relations.

Van Norman Moves

MOVING from Springfield, Mass., to New York City, Van Norman Industries confirms intention to become a diversified national company. It will keep its basic interest in machine tools and tool controls.

W. Raymond Parshall, newcomer to VNI, is now settling into new office as treasurer. Until January Parshall had been controller and treasurer of Federal Pacific Electric.

New Men in Driver's Seats

RESISTANCE wire maker Wilbur B. Driver Co., Newark, N. J., moves seven of its execs up into new officer ranks.

Sales v-p Sidney A. Wood takes over as executive vice president, serving as staff chief to president R. O. Driver. Sales manager Norman P. Norlie moves up to replace Wood.

Manufacturing vice president William J. Wind becomes senior vice president. H. Clark Smith Jr., former technical director, now occupies office of v-p for research and engineering.

New corporate secretary is general superintendent Raymond O. Hallberg, and auditor Samuel Rankin becomes treasurer. Robert W. Judkins, technical assistant to the president, is elevated to a directorship.

Plant BRIEFS

AIRCRAFT RADIO is moving into 10,000 sq ft of additional production space on its 130-acre tract in Boonton, N. J.

Hermetic Seal Transformer, Garland, Tex., is building a 14,000-sq ft plant addition to be finished next month.

Northeast Electronics Corp. is expanding out of leased quarters at the Concord, N. H., airport into a new building in Concord Industrial Park.

Air Reduction Co. is putting up a $9-million plant in Acton, Mass. New plant will turn out 75 tons of gases daily.

Executive MOVES

FERRITEMAKER General Ceramics gets a new board member in **William T. Golden,** board chairman of National-U.S. Radiator Corp.

Norman C. Anderson moves up to become v-p of Electronics Corp. of America's photoconductor division.

New board members of Philco Corp. are **Richard C. Bond,** president of Philadelphia's John Wanamaker department store, **Gaylord P. Harnwell,** president of University of Pennsylvania, and Philco treasurer **William R. Wilson.**

Benjamin J. Ainsworth moves in as production manager of Perkin Engineering Corp., El Segundo, Calif.

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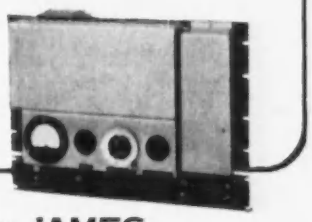

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Cleveland rep **Fred R. Sharp,** opening a Dayton-area office in Xenia, Ohio, takes on instrument line of Boston's Laboratory for Electronics.

Nickles Engineering, Rochester, N. Y., represents Robertshaw-Fulton's Fielden Instruments division in New York state.

Brush Electronics now distributes its industrial equipment line in western Massachusetts and Hartford county, Conn., through **Peaslee-Wells**, West Springfield, Mass.

Giant Chicago agency **Crossley Associates,** also owner of Electro Products Inc., is settling into a new 4,200-sq ft headquarters on the Windy City's north side. New building will house sales and service facilities. Other Crossley offices are in Dayton and St. Paul, with another coming in Indianapolis.

Paoli, Pa., rep **Charles R. Hile,** who already has a Baltimore office, this month shoots down the coast to Orlando, Fla., to open a third office. Former RCA components engineer William R. Lehman heads Hile's new place in the sun.

Seattle's **Arva Co.** now handles Varian Associates' line of microwave tubes in the great Northwest. Varian picked new Denver rep **Lahana & Co.** to sell microwave tubes and graphic recorders in the Mountain states.

Frank A. Emmet, Los Angeles, handles Dilectron components line in southern California, Arizona and southern Nevada.

O. F. Masin, Pelham, N. Y., adds San Fernando Electric's line of capacitors and custom-built potentiometers.

Gene French, Albuquerque, is new rep for Electro-Pulse's line in the Utah-Colorado-New Mexico area.

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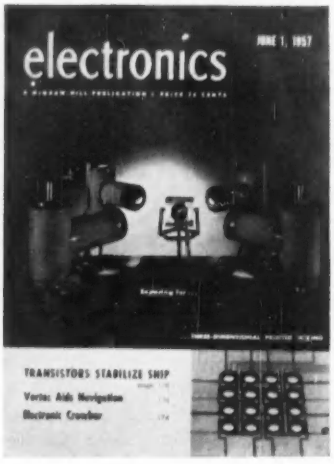
CLASSIFIED ADVERTISING
F. J. Eberle, Business Mgr.

BUSINESS OPPORTUNITIES 39

Coming in Our June 1 TECHNICAL Edition . . .

Pogo Stick up-down meter. Continuous-wave radar system described by S. Logue of Convair measures rates of climb and descent of Navy aircraft. Tests on doppler radar, operating at 10,000 mc, reveal performance from zero altitude up to 2,300 feet for vertical velocities up to 10 fps going up and 30 fps coming down.

Meltback tetrode. D. Baker of GE discusses four-electrode transistor design, construction and circuits. He points out that application of transverse bias to *pnp* germanium transistor through second base lead improves intermediate and high-frequency power gain.



Transistor counter design. Counters drive neon-lamp indicators at rates up to 100,000 per second in a high-reliability circuit. H. Chisholm of Beckman Instruments gives the step-by-step calculations for design of binary stages. Counter has logged 11,000 hours of continuous operation with no component failures or waveform deterioration.

Ocean thermometer. Walden, Ketchum and Frantz of the Woods Hole Oceanographic Institution describe buoy that telemeters sea temperature data. Audio-modulated r-f signal received by transistor receiver triggers temperature-measuring system. Cycle of transmission includes two standard tones and thermistor temperature data together with identifying code signal. Data can be obtained up to 600 miles by interrogating buoys at favorable propagation times.

Calming the sea. R. Scheib of Sperry Gyroscope Corp. describes stabilizing of missile ships by underwater fins controlled through computing and servo techniques. Servos, using transistor and magnetic amplifiers to obtain 15-watt output for fin orders, eliminate up to 90 percent of ship's roll. Device provides overload protection.

electronics READER SERVICE CARD

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If there is more than one advertisement on the page, the position of the ad will be indicated by letters following the page number. The letters following the page number will indicate the ad's positions: R-Right, RT-Right Top, RB-Right Bottom, L-Left, LT-Left Top, LB-Left Bottom, M-Middle, MT-Middle Top, MB-Middle Bottom (i.e. 230L). Diagrams on back of this page show how to use the key.

On pages with no number such as bleed pages, count from the last numbered page to find the number. Inserts are numbered using last numbered page plus A, B, etc. If you are not sure of a page number, consult the advertisers index.

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See Fractional Page Diagram on Other Side of This Page!

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SECTION A

2	7	10	25	31	34B	2nd Cover
5	8	16	27	32	37	3rd Cover
6	9	21	28	34T	38T	4th Cover

NEW PRODUCT INFORMATION? USE SECTION B

SECTION B

CIRCLE NEW PRODUCTS HERE

P1	P6	P11	P16	P21	P26	P31	P36	P41	P46	P51	P56	P61	P66	P71	P76	P81	P86	P91	P96
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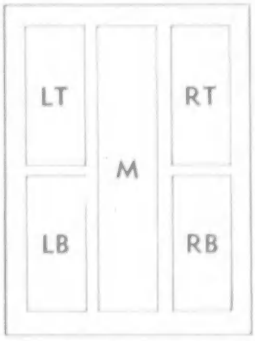
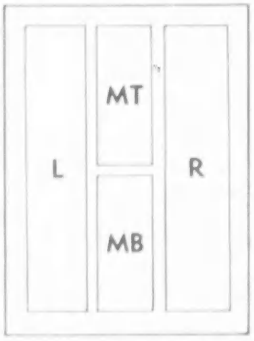
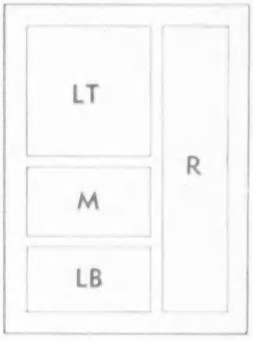
DIAGRAMS BELOW SHOW HOW TO USE THE KEY
ON PAGES WITH MORE THAN ONE ADVERTISEMENT







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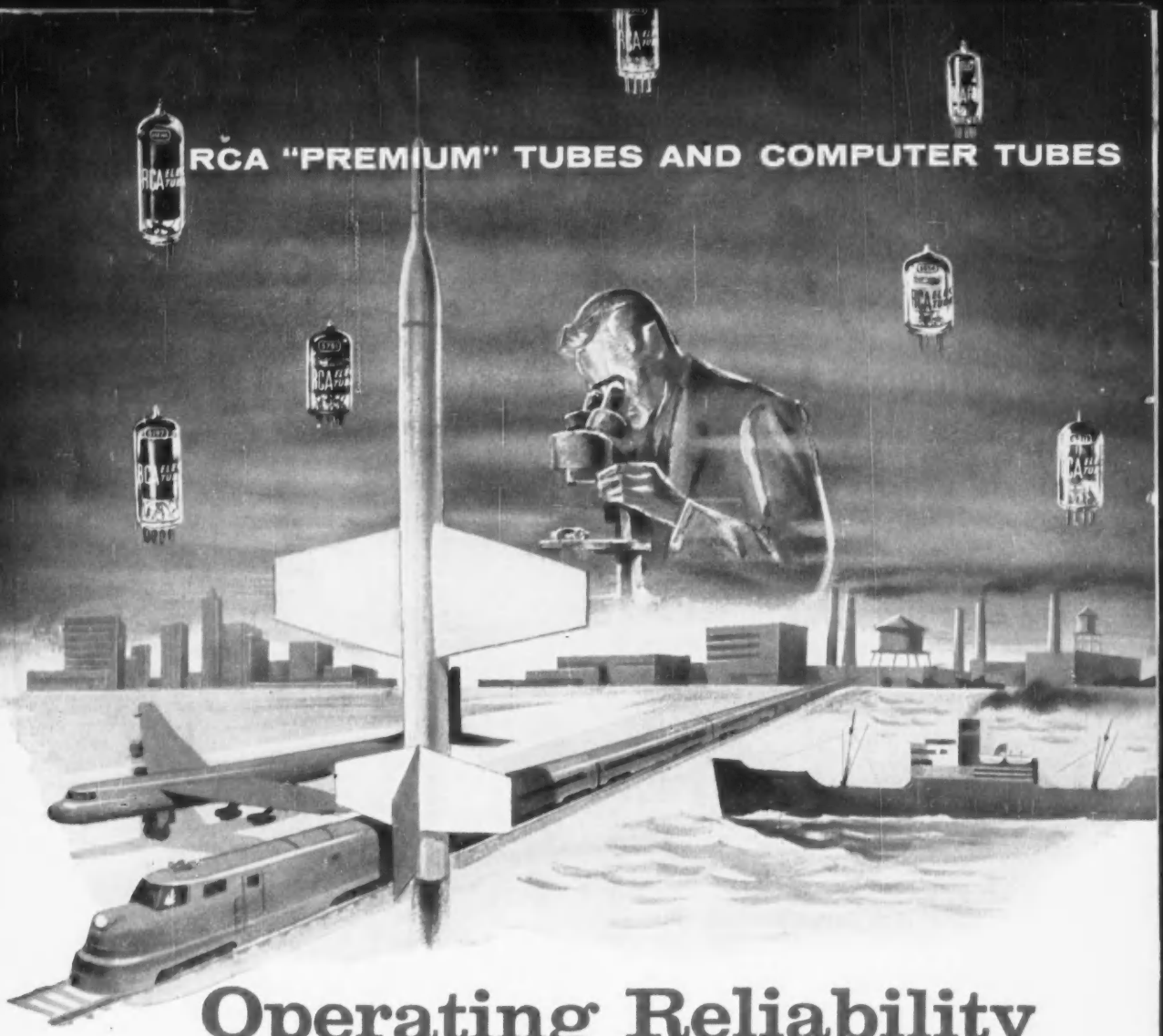

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